3.17 Cumulative Analysis

3.17.1 Purpose and Content of This Section

The purpose of this section is to summarize the potential cumulative physical and growth-related environmental consequences associated with the HST Network Alternatives.[1] The analysis focuses on regional scenarios and programmatic estimates of potential impacts; therefore, the magnitude of impacts reported in this document is likely to be considerably larger than the actual impacts that would be expected from the HST system in the study area.

Refer to Chapter 3, "Affected Environment, Environmental Consequences, and Mitigation Strategies," and Chapter 7, "High-Speed Train Network and Alignment Alternatives Comparisons," for a presentation of potential environmental consequences in each environmental resource area.

This section is organized into the following sections:

- Regulatory requirements and methods of evaluation.
- Cumulative projects and growth projections.
- Analysis of cumulative impacts by environmental resource area.

3.17.2 Regulatory Requirements and Methods of Evaluation

A. REGULATORY REQUIREMENTS

<u>National Environmental Policy Act (NEPA)</u>

Under NEPA, a cumulative impact is the impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR § 1508.7).

A cumulative impact includes the total effect on a natural resource, ecosystem, or human community attributable to past, present, or reasonably foreseeable future activities or actions of federal, nonfederal, public, and private entities. Cumulative impacts also may include the effects of natural processes and events, depending on the specific resource in question. Cumulative impacts include the total of all impacts on a particular resource that have occurred, are occurring, and will likely occur as a result of any action or influence, including the direct and indirect impacts of a federal activity. Accordingly, there may be different levels of cumulative impacts on different environmental resources.

<u>California Environmental Quality Act (CEQA)</u>

Under CEQA, cumulative impacts are defined as two or more individual effects that, when considered together, are considerable or compound or increase other environmental impacts. The cumulative impact from several projects is the change in the environment that results from the incremental impact of the project when added to other closely related past, present, and reasonably foreseeable probable future projects. Cumulative impacts can result from individually minor but collectively significant projects taking place over a period of time (State CEQA Guidelines Section 15355).

[1] See Section 3.0, Introduction, for an explanation of how this section fits together with the HST Network Alternatives presented in Chapter 7, as well as for an overview of the information presented in the other chapters.

A project's contribution to a cumulative impact may be considered less than significant if it is implementing a plan or program designed to avoid the cumulative impact (State CEQA Guidelines Section 15064[h]) or if it will implement or fund its fair share of a mitigation measure designed to alleviate the cumulative impact (State CEQA Guidelines Section 15130[a]).

Under CEQA, the discussion of cumulative impacts should reflect the severity of the impacts and their likelihood of occurrence, but the discussion may be less detailed than the analysis of the project's individual effects. The discussion should be guided by the standards of practicality and reasonableness and should focus on the cumulative impact to which the identified other projects contribute, rather than the attributes of the other projects that do not contribute to the cumulative impact (State CEQA Guidelines Section 15130[b]).

As further defined under State CEQA Guidelines Section 15130(b), the following elements are necessary in an adequate discussion of significant cumulative impacts:

(1) Either:

  (A) A list of past, present, future, and probably future projects producing related or cumulative impacts, including, if necessary, those projects outside the control of the agency, or

  (B) A summary of projections contained in an adopted general plan or related planning document, or in a prior environmental document which has been adopted or certified, which described or evaluated regional or areawide conditions contributing to the cumulative impact. Any such planning document shall be referenced and made available to the public at a location specified by the lead agency.

(2) When utilizing a list, factors to consider when determining whether to include a related project should include the nature of each environmental resource being examined, the location of the project and its type.

(3) Lead agencies should define a geographic scope of the area affected by the cumulative effect and provide a reasonable explanation for the geographic limitation used.

(4) A summary of the expected environmental effects to be produced by those projects with specific reference to additional information stating where that information is available; and

(5) A reasonable analysis of the cumulative impacts of the relevant projects. An EIR shall examine reasonable, feasible options for mitigating or avoiding the project's contribution to any significant cumulative effects.

Both CEQA and NEPA allow the scope of a cumulative impact analysis to be limited through the use of tiering (40 CFR 1508.28, State CEQA Guidelines 15130). Tiering can be used when cumulative impacts have been addressed adequately in a previous document certified for a programmatic plan and the current project is consistent with the plan. The statewide program EIS/EIR evaluated cumulative impacts using a list of major projects for consideration in the cumulative impact analysis. Although the statewide program EIS/EIR analysis helped identify cumulative projects for this project, the cumulative analysis contained herein is not tiered off the previous statewide document because it is also programmatic and relates just to the Bay Area to Central Valley study area. This section includes an analysis of cumulative impacts resulting from transportation, land use, redevelopment, and other projects that have the potential to affect similar resources in the vicinity of the proposed project.

B. METHODS OF EVALUATION OF IMPACTS

Because of the broad regional nature of the proposed HST project and the programmatic nature of this document, the cumulative impact analysis uses both the list and projections approach to evaluate potential cumulative impacts of the project. The discussion below identifies the methods employed to identify the cumulative scenario.

The cumulative projects list incorporates reasonably foreseeable, relevant projects and focuses on those that, when combined with the proposed HST Network Alternatives, could contribute to cumulative impacts. Projects considered in the cumulative impacts analysis were identified through (1) telephone conversations with respective city planners and engineers and (2) review of projects identified under applicable Bay Area and Central Valley regional transportation improvement plans (RTIP) as part of the State Transportation Improvement Plan (STIP). Based on information provided by the local jurisdictions and the STIP, the cumulative projects list was prepared; the list identifies projects in the same geographic area as the proposed HST project, including projects for which development is underway, for which applications have been filed, or that have recently been approved but not yet constructed. The following criteria were used to narrow the list of projects considered in the analysis:

- Projects that are under active consideration.
- Projects that have recently completed or are in some active stage of completing project-level environmental documentation.
- Projects that would be completed or operational within the timeframe being considered for the HST project and in the same vicinity.
- Projects in proximity and of a size/scale that, in combination with the HST Network Alternatives, have the potential to affect the same resources.

To consider the cumulative scenario relative to planned development not identified under the cumulative projects list, projections for population, employment, and urbanization were used.

In accordance with State CEQA Guidelines (Section 15130[b]), the analysis of cumulative effects is qualitative. Both cumulative impacts associated with future projects and future regional growth are identified. The cumulative projects are discussed in detail in Appendix 3.17-A, and growth inducement and indirect effects from growth are described in Chapter 5, "Economic Growth and Related Impacts."

3.17.3 Cumulative Projects and Growth Forecasts

A. CUMULATIVE PROJECTS LIST

The HST Network Alternatives represent different ways to implement the HST system between the Bay Area and Central Valley along combinations of HST Alignment Alternatives and station location options (refer to Chapter 7, "High-Speed Train Network and Alignment Alternatives Comparisons"). The HST system would continue outside the study area to the major metropolitan areas in the state, as described in the statewide program EIR/EIS (Authority and FRA November 2005). The network alternatives are grouped into three route options: Altamont Pass, Pacheco Pass, and Pacheco Pass with Altamont Pass (local service). The following route options contain 21 network alternatives:

Altamont Pass Network Alternatives	Pacheco Pass Network Alternatives	Pacheco Pass with Altamont Pass (local service) Network Alternatives
• San Francisco & San Jose Termini	• San Francisco & San Jose Termini	• San Francisco & San Jose Termini
• Oakland & San Jose Termini	• Oakland & San Jose Termini	• Oakland & San Jose Termini
• San Francisco, Oakland & San Jose Termini	• San Francisco, Oakland, & San Jose Termini	• San Francisco, Oakland, & San Jose Termini (without Dumbarton Bridge)
• San Jose Terminus	• San Jose Terminus	• San Jose Terminus
• San Francisco Terminus	• San Jose, San Francisco & Oakland—via Transbay Tube	
• Oakland Terminus	• San Jose, Oakland & San Francisco—via Transbay Tube	
• Union City Terminus		
• San Francisco & San Jose—via San Francisco Peninsula		
• San Francisco, San Jose, Oakland—no Bay Crossing		
• Oakland & San Francisco—via Transbay Tube		
• San Jose, Oakland, & San Francisco—via Transbay Tube		

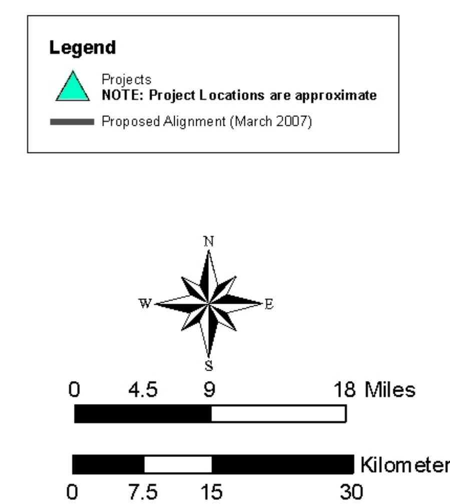
The cumulative projects included in this analysis are those that are either close to the HST Network Alternatives or of a size/scale that could affect regional resources. One of the major projects currently underway is the San Francisco Bay Area Regional Rail Plan (Plan) being prepared by the MTC, BART, Caltrain, and the Authority. The Regional Rail Plan will look at improvements and extensions of railroad, rapid transit, and high-speed rail services for the near term (5–10 years), intermediate term (10–25 years), and long term (beyond 25 years). Given the close coordination between the two projects, their similar nature, and in some cases the same rights-of-way and stations, the Plan is discussed below. Other cumulative projects are discussed in detail in Appendix 3.17-A. This information represents the most up-to-date and accurate information available as of the date of publication of this document.

Table 3.17-1 summarizes the locations of the cumulative projects relative to the HST Network Alternatives. The locations of the cumulative projects in relation to the HST Network Alternatives are also illustrated in Figure 3.17-1.

Regional Rail Plan for the San Francisco Bay Area

The MTC, BART, Caltrain, and the Authority, along with a coalition of rail passenger and freight operators, prepared the Regional Rail Plan for the San Francisco Bay Area per the specifications of Regional Measure 2 (RM2), approved in 2004. RM2 specified and provided funding for the preparation of a comprehensive master plan for Bay Area rail (MTC 2007). The Plan completed the unfinished work of the 1957 Rail Plan and addressed new opportunities. The Plan also established a long-range vision to create a Bay Area rail network that addresses the anticipated growth in transportation demand and meets that demand. The Plan examined ways to incorporate expanded passenger train services into existing rail systems, improve connections to other trains and transit, expand the regional rapid transit network, increase rail capacity, coordinate rail investment around

Key	
AA	San Francisco Bay Regional Rail Plan (see Figure 3.17-2)
A	South Hayward BART/Mission Boulevard Concept Design Plan
B	Hayward Cannery Area Development Plan
C	Avenue 64 Apartments Project
D	Bay Street Site B
E	Christie Park Towers
F	Redevelopment of Amtrak Station in Emeryville
G	Marketplace Expansion Project
H	Powell Undercrossing Project
J	Infrastructure Improvements
K	Proposed Retail Center
L	Proposed Retail Center (2)
M	State Route 99/233 Interchange
O	Chowchilla Other Projects
P	El Rancho San Benito
Q	Transbay Program-Transbay Transit Center
R	Redevelopment Plan for the Transbay Redevelopment Project Area
S	Visitacion Valley/Schlage Lock Master Plan
T	Redwood City Downtown Precise Plan
U	Millbrae Station Area Specific Plan
V	San Carlos
W	San Bruno
X	Central Core Redevelopment Project
Y	Salida Community Plan
Z	Modesto Redevelopment Area Master Plan
1	Modesto Condominium Complex
2	Turlock Northwest Triangle Specific Plan
3	Turlock Southeast Area Feasibility Study
4	UC Merced
5	Campus Parkway
6	University Community Plan
7	Capitol Corridor South Hayward Rail Improvements
STP-1	Union City Intermodal Station
STP-2	Emeryville Intermodal Transfer Station Parking
STP-3	Madera Gateway & UPRR Bike/Pedestrian UC
STP-4	Caltrans Madera Amtrak Station Relocation
STP-5	4th Street Widening, City of Madera
STP-6	Robertson Boulevard Improvements (Palm Parkway to 15th Street), Chowchilla
STP-7	Caltrain Downtown Extension to Transbay Terminal
STP-8	BART Seismic Retrofit (Embarcadero, 16th St, SF station platforms)
STP-9	US 101 Aux Lanes from 3rd Avenue San mateo to Millbrae Avenue, Millbrae
STP-10	Capitol Corridor-San Jose-Santa Clara Fourth Main
STP-11	Sunnyvale - Borregas Avenue Bike/pedestrian Bridges
STP-12	Passing Lanes - Near Gilroy (State Route 152 Expressway)
STP-13	Truck Climbing Lanes - Near Gilroy (State Route 152 Expressway)
STP-14	State Route 152/SR-156 Interchange Improvements
STP-15	Sunol Grade Southbound HOV Lane Phase 3
STP-16	Tilton and Poplar Grade Separations in San Mateo
STP-17	US 101/Willow Road Interchange Reconstruction
STP-18	US 101Auxiliary Lanes - Santa Clara Co. Line to San Mateo County
STP-19	Stockton ACE Northwest Track Connection
STP-20	Tracy Downtown Multimodal Station
STP-21	Lathrop Road Grade Separation with UPRR
STP-22	San Joaquin Regional Rail Commission - Stockton Southern Pacific Depot Restoration
STP-23	BART Oakland Airport Connector
STP-24	Virgina Corridor Rails to Trails in Modesto
STP-25	State Route 132 Expressway
STP-26	State Route 132 East Infill Project
STP-27	State Route 152 Los Banos Bypass



U.S. Department of Transportation
Federal Railroad Administration

Figure 3.17-1
Cumulative Projects

Table 3.17-1. Cumulative Projects Associated with HST Network Alternatives

Cumulative Project Code	Cumulative Project	Altamont Pass Network Alternatives											Pacheco Pass Network Alternatives						Pacheco Pass with Altamont Pass (local service)			
		San Francisco & San Jose Termini	Oakland & San Jose Termini	San Francisco, Oakland & San Jose Termini	San Jose Terminus	San Francisco Terminus	Oakland Terminus	Union City Terminus	San Francisco & San Jose - via SF Peninsula	San Francisco, San Jose, Oakland – no Bay Crossing	Oakland & San Francisco – via Transbay Tube	San Jose, Oakland, & San Francisco via Transbay Tube	San Francisco & San Jose Termini	Oakland & San Jose Termini	San Francisco, Oakland, & San Jose Termini	San Jose Terminus	San Jose, San Francisco & Oakland-via Transbay Tube	San Jose, Oakland & San Francisco-via Transbay Tube	San Francisco & San Jose Termini	Oakland & San Jose Termini	SF, Oak, & SJ Termini (without Dumbarton Bridge)	San Jose Terminus
AA	San Francisco Bay Area Regional Rail Plan	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
A	South Hayward BART/Mission Blvd. Concept Design Plan		X	X			X			X	X	X		X	X			X		X	X	
B	Hayward Cannery Area Development Plan		X	X			X			X	X	X		X	X			X		X	X	
C	Avenue 64 Apartments Project		X	X			X			X	X	X		X	X			X		X	X	
D	Bay Street Site B		X	X			X			X	X	X		X	X			X		X	X	
E	Christie Park Towers		X	X			X			X	X	X		X	X			X		X	X	
F	Redevelopment of Amtrak Station in Emeryville		X	X			X			X	X	X		X	X			X		X	X	
G	Marketplace Expansion Project		X	X			X			X	X	X		X	X			X		X	X	
H	Powell Undercrossing Project		X	X			X			X	X	X		X	X			X		X	X	
I	Inter-Modal Station Passenger Rail Project		X	X			X	X		X	X	X		X	X			X		X	X	
J	UPRR Infrastructure Improvements - Madera	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
K	Proposed Retail Center	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
L	Proposed Retail Center (2)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
M	State Route 99/233 Interchange	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
O	Chowchilla Other Projects	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
P	El Rancho San Benito												X	X	X	X	X	X	X	X	X	X
Q	Transbay Program-Transbay Transit Center	X		X		X			X	X	X	X	X		X		X	X	X		X	
R	Redevelopment Plan for the Transbay Redevelopment Project Area	X		X		X			X	X	X	X	X		X		X	X	X		X	
S	Visitacion Valley/Schlage Lock Master Plan	X		X		X			X	X			X		X		X		X		X	
T	Redwood City Downtown Precise Plan	X	X	X	X	X	X	X	X	X	X	X	X		X		X		X		X	
U	Millbrae Station Area Specific Plan	X	X	X	X	X	X	X	X	X	X	X	X		X		X				X	
V	San Carlos	X	X	X	X	X	X	X	X	X	X	X	X		X		X		X		X	
W	San Bruno	X	X	X	X	X	X	X	X	X	X	X	X		X		X		X		X	
X	Central Core Redevelopment Project	X	X	X	X	X	X	X	X	X	X	X	X				X		X		X	
Y	Salida Community Plan	X	X	X	X	X	X	X	X	X	X	X							X	X	X	X
Z	Modesto Redevelopment Area Master Plan	X	X	X	X	X	X	X	X	X	X	X							X	X	X	X
1	Modesto Condominium Complex	X	X	X	X	X	X	X	X	X	X	X							X	X	X	X
2	Turlock Northwest Triangle Specific Plan	X	X	X	X	X	X	X	X	X	X	X							X	X	X	X
3	Turlock Southeast Area Feasibility Study	X	X	X	X	X	X	X	X	X	X	X							X	X	X	X
4	UC Merced	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
5	Campus Expressway	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
6	Capitol Corridor South Hayward Rail Improvements		X	X			X			X	X	X		X	X			X		X	X	
7	Merced County University Community Plan	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Table 3.17-1. Continued

Cumulative Project Code	Cumulative Project	Altamont Pass Network Alternatives											Pacheco Pass Network Alternatives						Pacheco Pass with Altamont Pass (local service)			
		San Francisco & San Jose Termini	Oakland & San Jose Termini	San Francisco, Oakland & San Jose Termini	San Jose Terminus	San Francisco Terminus	Oakland Terminus	Union City Terminus	San Francisco & San Jose - via SF Peninsula	San Francisco, San Jose, Oakland – no Bay Crossing	Oakland & San Francisco – via Transbay Tube	San Jose, Oakland, & San Francisco via Transbay Tube	San Francisco & San Jose Termini	Oakland & San Jose Termini	San Francisco, Oakland, & San Jose Termini	San Jose Terminus	San Jose, San Francisco & Oakland-via Transbay Tube	San Jose, Oakland & San Francisco-via Transbay Tube	San Francisco & San Jose Termini	Oakland & San Jose Termini	SF, Oak, & SJ Termini (without Dumbarton Bridge)	San Jose Terminus
STP-1	Union City Intermodal Station		X	X			X	X		X	X	X		X	X			X		X	X	
STP-2	Emeryville Intermodal Transfer Station Parking		X	X			X			X	X	X		X	X			X		X	X	
STP-3	Madera Gateway & UPRR Bike/Pedestrian UC	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
STP-4	Caltrans Madera Amtrak Station Relocation	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
STP-5	4th Street Widening, City of Madera	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
STP-6	Robertson Boulevard Improvements (Palm Parkway to 15th Street), Chowchilla	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
STP-7	Caltrain Downtown Extension to Transbay Transit Center	X		X		X		X	X			X										
STP-8	BART Seismic Retrofit (Embarcadero, 16th St, SF station platforms)	X		X		X		X	X			X										
STP-9	US 101 Aux Lanes from 3rd Avenue San mateo to Millbrae Avenue, Millbrae	X		X		X		X	X			X										
STP-10	Capitol Corridor-San Jose-Santa Clara Fourth Main	X	X	X	X				X	X		X	X	X	X	X	X	X	X	X	X	X
STP-11	Sunnyvale - Borregas Avenue Bike/pedestrian Bridges								X	X			X		X		X		X		X	
STP-12	Passing Lanes - Near Gilroy (State Route 152 Expressway)												X	X	X	X	X	X	X	X	X	X
STP-13	Truck Climbing Lanes - Near Gilroy (State Route 152 Expressway)												X	X	X	X	X	X	X	X	X	X
STP-14	State Route 152/SR-156 Interchange Improvements												X	X	X	X	X	X	X	X	X	X
STP-15	Sunol Grade Southbound HOV Lane Phase 3	X	X	X	X					X		X		X	X			X		X	X	X
STP-16	Tilton and Poplar Grade Separations in San Mateo	X		X		X			X	X			X		X		X		X		X	
STP-17	US 101/Willow Road Interchange Reconstruction	X		X		X			X	X			X		X		X		X		X	
STP-18	US 101 Auxiliary Lanes – Santa Clara Co. Line to San Mateo County								X	X			X		X		X		X		X	
STP-19	Stockton ACE Northwest Track Connection	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
STP-20	Tracy Downtown Multimodal Station	X																				
STP-21	Lathrop Road Grade Separation with UPRR	X																				
STP-22	San Joaquin Regional Rail Commission – Stockton Southern Pacific Depot Restoration	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
STP-23	BART Oakland Airport Connector		X	X			X			X	X	X		X	X			X		X	X	
STP-24	Virginia Corridor Rails to Trails in Modesto	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
STP-25	State Route 132 Expressway	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
STP-26	State Route 132 East Infill Project	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
STP-27	State Route 152 Los Banos Bypass Project												X	X	X	X	X	X	X	X	X	X

transit-friendly communities and businesses, and identify functional and institutional consolidation opportunities. The plan also included a detailed analysis of potential high-speed rail routes between the Bay Area and the Central Valley that are consistent with the HST Network Alternatives in this environmental document. As noted above, the Plan looked at improvements for the near term, intermediate term, and long term. The Plan's network and services are intended to:

- Address the combined challenges of moving people and goods.
- Link people with commercial, employment, and residential centers.
- Expand capacity for goods movements to support the regional economy.
- Serve as the backbone of an integrated regional transit network with seamless connections at key transit hubs to local transit services.
- Accommodate development of statewide high-speed rail and enable operation of regional services along high-speed lines, and vice-versa.
- Include policies and incentives to encourage local governments to create well-designed, walkable communities with a mix of services near transit.
- Explore a governance structure that can develop regional system improvements and deliver coordinated, customer-oriented services.

Core Elements
There are five core elements of the Plan:

- BART.
- Railroad-based regional passenger services, e.g., Capitol Corridor, Caltrain, ACE, etc.
- High-Speed Rail.
- Accommodation of increased rail freight movements attributable to economic growth.
- Long-term land use, including the impact of “smart growth” policies.

Following full technical analysis of alternatives, the study will designate the most promising systemwide alternatives, both for scenarios without high-speed rail and for scenarios that include high-speed rail from either the east (Altamont Pass) or south (Pacheco Pass).

Evaluation of systemwide alternatives will consider travel performance, cost, and impacts for two horizon years (2030 and 2040/50). Corridor-level evaluation and phasing considerations will distinguish the Year 2030 plan from the Year 2050 plan; the Year 2030 plan would be developed from the Resolution 3434 network.[2] The Plan base case or No Project Alternative includes the existing financially constrained MTC RTP and the ten rail extensions (as well as service improvements to ACE, Caltrain, and the Capitol Corridor) identified in MTC Resolution 3434. The ten rail extensions identified in MTC’s Resolution 3434 are:

1. BART/East Contra Costa Rail (eBART)
2. ACE Increased Services
3. BART/I-580 Rail Right-of-Way Preservation
4. Dumbarton Bridge Rail Service
5. BART/Fremont–Warm Springs to San Jose Extension

[2] For more information please see the MTC website at: www.mtc.ca.gov

6. Caltrain/Rapid Rail/Electrification & Extension to Downtown San Francisco/Transbay Transit Center
7. Caltrain Express Service
8. SMART (Sonoma-Marin Rail)
9. Capitol Corridor/Increased Services
10. BART/Oakland Airport Connector

Themes and Alternatives

Different themes for each of the five major Plan elements are explored in the Plan and systemwide alternatives:

High-Speed Rail—Regional Rail Overlay

The study of high-speed rail in the Plan is consistent with the HST Network Alternatives described in this Draft Program EIR/EIS. As the HST system involves major infrastructure investment, the Plan identified and evaluated options for providing overlay services (use of the HST infrastructure for regional rail service with additional investments in facilities and compatible rolling stock).

Regional overlay operations on HST lines could provide service to additional local stations along the HST lines. Such local stops typically would be developed as four-track sections with a pair of outside platforms for regional trains and two express tracks (no platforms) in the center. The extent of the four-track sections would depend on the prevailing speed of the line for statewide service as well as the spacing and location of the local stops. The regional overlay services would be operated with compatible equipment, but the average speeds and overall travel times would be greater than the HST because of the additional stops. As additional investment would be necessary to provide the infrastructure for such regional overlay services, these additional regional services need to be evaluated for cost-effectiveness.

BART

The following three themes are considered for expansion of BART:

1. BART is extended and expanded beyond the Resolution 3434 base case to become a system providing regional service throughout the Bay Area counties similar to the original BART plan.
2. BART is not extended, but infill stations are constructed and service is concentrated to provide mass transit service in dense areas with express service and/or skip-stop service being used to provide adequate travel times for longer length trips.
3. The BART system remains largely as is with improvements focused on core capacity needs; alternative technologies are used to extend coverage except where short extensions of the BART technology would provide the most beneficial solution.

Railroad-Based Passenger Services

Different levels of improvement to passenger rail services along existing conventional rail lines are explored. At the highest level of improvement, infrastructure would be similar to the HST infrastructure. With HST implementation, overlay service in the HST corridors would substitute for the railroad-based passenger service. High, low, and hybrid themes are explored for passenger rail services:

1. High: existing conventional rail lines are upgraded ultimately to provide 115 mph (185 kph) service operating throughout the region on separate electrified grade-separated trackage along principal line segments; passenger service is withdrawn from existing freight tracks along principal lines, thereby improving capacity for goods movement.

2. Low: appropriate capacity and operational improvements, including signaling, passing tracks and/or multi-tracking and route alignments, are constructed along shared lines to accommodate the projected increases in combined passenger and freight demand in shared freight/passenger corridors using FRA-compliant equipment with higher speeds. With HST implementation, the HST would be on separate trackage without an overlay service.
3. Hybrid: a combined strategy is pursued in which an appropriate vehicle technology and infrastructure solution is selected on a corridor-by-corridor basis, considering adjacent corridors and other systems (e.g., BART and the HST) so that a consistent, workable systemwide plan results.

Freight
Different scenarios for freight movements are considered including maintaining existing practices with some improvements to accommodate traffic growth. A second scenario considers a coordinated and optimized operation of freight and passenger trains with infrastructure improvements. A third scenario considers consolidating portions of the regional rail network under public ownership and controlling from a consolidated passenger–freight dispatch center with major infrastructure improvements and rerouting of freight traffic.

Land Use
The Plan considers the linkage between land use and transportation in a framework for Plan implementation and explores three significantly different development patterns:

1. Urban Infill "Core" Development—Concentration of growth in existing urban areas by focusing growth on vacant or underutilized lands.
2. Urban-Suburban "Hub and Spoke" Development—Combination of urban infill and continued suburbanization along spokes of residential-intensive communities surrounding the inner Bay Area.
3. Regional "Web" Development—Growth of outlying areas serving clusters of employment and housing tied to local industry geography.

Principal Corridors
The Plan study area was divided into geographically distinct corridors connecting major population centers that also reflect the logic of rail infrastructure. Within the overall Plan study area bounded by Cloverdale and Auburn to the northwest and northeast and by Monterey and Merced to the southwest and southeast are 12 distinct transportation corridors (Figure 3.17-2):

1. BART System (all lines)
2. US 101 North Corridor (Marin – Sonoma)
3. North Bay Corridor (Marin – Sonoma)
4. I-80 Corridor (Auburn – Oakland)
5. East Bay Corridor (Oakland – San Jose)
6. Transbay Corridor (San Francisco – Oakland)
7. Peninsula Corridor (San Francisco – San Jose)
8. South Counties Corridor (Santa Cruz , Monterey, San Benito)
9. Dumbarton Corridor (Redwood City – Union City)
10. I-680 & Tri-Valley Corridor (Contra Costa & Southern Alameda)
11. Central Valley Corridor (Sacramento – Merced)

12. Grade Crossings and Grade Separations (all lines)

San Francisco Bay Area Regional Rail Plan Conclusions

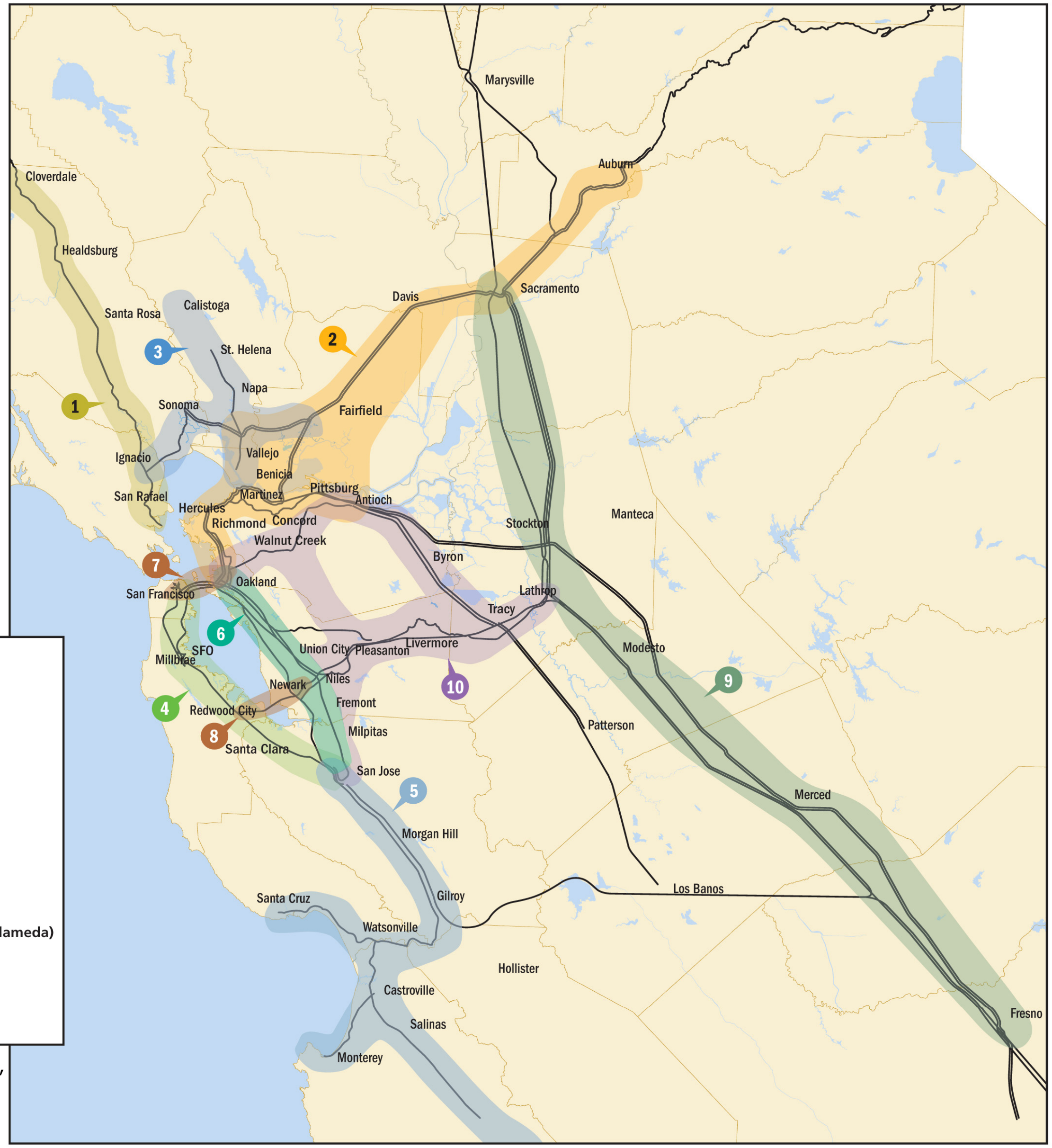
This Regional Rail Plan Revised Draft Report was prepared in response to input received from the public. In August 2007, a series of regional rail workshops were held to solicit input on a Draft Summary Report of the Regional Rail Plan, which was first presented and reviewed by a steering committee in July 2007. A final report of the Regional Rail Plan for the San Francisco Bay Area was prepared and was adopted by MTC in September 2007. The final report includes a "Regional Rail Vision" and has three scenario outcomes: 1) without High-Speed Rail; 2) with High-Speed Rail via Altamont Pass; and 3) with High-Speed Rail via Pacheco Pass. For each of these three outcomes, improvements were recommended for the 12 corridors.

Regional Rail Vision

The executive summary of the final Regional Rail Plan presents the Regional Rail Vision as follows (pg ES-3):

- Ring the Bay with Rail: A long-term vision of many in the region is to ring the Bay, connecting the three major Bay Area cities (San Francisco, Oakland, and San Jose), with fast, frequent and integrated passenger rail network.
- The Right Technology Should Be Used With the Right Corridor: A broad range of rail technologies, including BART and conventional passenger trains like Amtrak, are considered in this plan. Emerging technologies such as non-Federal Railroad Administration compliant Electric Multiple Unit (EMU) trains are also explored.
- The BART & Caltrain Systems Are the Backbone: The BART and Caltrain systems serve as the backbone of the regional rail network and it is clear there will be capacity constraints and renovation needs for the existing systems. This reinvestment should be a top regional priority over the next few decades.
- The BART System's Outward Expansion Is Nearly Complete: While BART will always remain at the core of the region's rail system, its outward expansion potential is limited. Once the extension to San Jose is completed, and the existing lines are brought to logical terminals in Livermore, Santa Clara, and East Contra Costa County, no additional outward extensions of the BART technology are contemplated. Higher-speed express trains would better serve outlying suburban markets. Instead, BART will evolve toward a higher-frequency, highly productive metro system.
- The Bay Area Needs a Regional Rail Network: As the BART system becomes more of a high-frequency, close stop spacing urban subway system, it needs to be complemented with a larger regional express network serving longer-distance trips. These trains would run largely on existing tracks, some shared with freight and others in their own rights-of-way with specialized signaling and dispatch systems.
- Rail Infrastructure Must Be Expanded to Accommodate Growth in Passenger and Freight Traffic: To allow the region's economy to continue growing while meeting increased passenger needs, the freight and passenger rail systems must be increasingly accommodated. Certain freight corridors require additional mainline tracks to support high-frequency freight and passenger services.
- High-Speed Rail Provides Opportunities to Enhance and Accelerate Regional Rail Improvements: High-speed rail complements and supports the development of regional rail—a statewide high-speed train network would enable the operation of fast, frequent regional services along the high-speed lines and should provide additional and accelerated funding where high-speed and regional lines are present in the same corridor.

Study Corridors



LEGEND:

1 US 101 North Corridor (Marin ↔ Sonoma)
2 I-80 Corridor (Auburn ↔ Oakland)
3 North Bay Corridor (Marin ↔ Solano)
4 Peninsula Corridor (San Francisco ↔ San Jose)
5 South Counties Corridor (Santa Cruz, Monterey, San Benito)
6 East Bay Corridor (Oakland ↔ San Jose)
7 Transbay Corridor (San Francisco ↔ Oakland)
8 Dumbarton Corridor (Redwood City ↔ Union City)
9 Central Valley Corridor (Sacramento ↔ Merced)
10 I-680 and Tri-Valley Corridor (Contra Costa & Southern Alameda)

Not Shown:

BART System (all lines)

Grade Crossings and Grade Separations (all lines)

Source: Regional Rail Plan for the San Francisco Bay Area, September 2007.

Figure 3.17-2
Regional Rail Plan Corridors Map

Regional Rail without High-Speed Rail
The Plan for Regional Rail without High-Speed Rail includes:

- BART: Improve core capacity, implement Resolution 3434 extensions; extend BART to Livermore; construct fourth track through Oakland; develop infill stations; increase capacity; and in the longer term pursue a second Bay crossing (between San Francisco and Oakland).
- US 101 North: Implement non-electric SMART project (in the early years with 30-minute headways).
- North Bay: Corridor preservation and consideration of standard non-electric rail services.
- I-80 & East Bay: Expand East Bay non-electric standard rail network from San Jose to Sacramento to three tracks with some four-track sections.
- Transbay: Provide near-term investments in BART Core Capacity (higher-capacity cars, improved signaling, etc.); in the long term, provide new transbay tube and San Francisco BART Line paired with rail tunnel.
- South Counties: Extend non-electric conventional rail service to Salinas, with further expansion to provide rail connections to Monterey and Santa Cruz.
- Peninsula: Expand Caltrain to three or four tracks and operate with lightweight electric multiple-unit equipment.
- Dumbarton: In the near term, implement service between Union City and Redwood City with standard railroad equipment; in the long term, develop separate passenger-only trackage from Redwood City to Union City to support lightweight equipment compatible with Caltrain Peninsula operations.
- Tri-Valley/I680: Add trackage to support improved non-electric conventional passenger service along the ACE rail corridor and to accommodate regional freight trains for approximate 100-minute operating time between Stockton and San Jose. Develop regional bus options in the I-680 corridor.
- Central Valley: Provide a non-electric conventional regional corridor service between Sacramento and Merced over the long term, interlined with ACE services and complimenting the San Joaquin long haul trains.

The estimated total capital cost of the Regional Rail Plan is about $45 billion (2006 dollars). Funding for Regional Rail investments beyond current Resolution 3434 commitments will likely come from multiple sources, including federal, state, regional, local, and public/private partnerships, and other sources.

Regional Rail with High-Speed Rail
The Plan analysis identified numerous opportunities to operate regional "overlay" services across high-speed lines within northern California. Implementation of these services would require provision of four tracks at the regional stations as well as approaching and departing the regional stations. Regardless of which Altamont or Pacheco alignment alternatives would be developed, an initial phase of investment would be on the San Francisco Peninsula between San Jose and San Francisco to make the Caltrain corridor "high-speed rail ready" for operation as a grade-separated, higher speed alignment suitable for use of electric, multiple-unit equipment. The Plan with HST is very similar to the Plan without HST, except that HST would provide a higher level of service and additional and accelerated funding where HST and regional rail lines are in the same corridor.

The Plan concluded that both the Altamont Pass and Pacheco Pass alignments have similar total costs, and that to accommodate regional services on HST infrastructure would add about $1 billion. The Plan states, "if either Altamont or Pacheco were selected as the sole option, 4-track sections would be needed at regional stations as well as approaching and departing regional stops. These four-track sections would be required along the Altamont route between Fremont and Tracy and along the Pacheco route between San Jose and Gilroy. By contrast, with an Altamont + Pacheco option, two-track section would suffice from San Jose to Gilroy and from Fremont to Tracy." (page ES-17).

The Plan also concluded that Altamont and Pacheco would have similar regional ridership levels of approximately 54 million to 56 million northern California trips in Year 2030 (including both intra-regional trips within northern California as well as inter-regional trips to points south of Merced). The Plan states, "An Altamont alignment would have higher regional ridership (between points located from Merced and north) of 20-million trips in Year 2030 vs. about 16-million trips for a Pacheco alignment – by contrast, a Pacheco alignment would have higher ridership between Northern California and Southern California (between points located from Fresno and south) of 40-million trips in Year 2030 vs. about 34-million trips for an Altamont alignment" (pg ES-17).

The Plan outcome "with High-Speed Rail via Altamont Pass" presents the opportunity for shared infrastructure and shared costs with the statewide HST system in several of the corridors under investigation: the Tri-Valley (Altamont Pass), the East Bay, Peninsula, Transbay, and Central Valley. The potential number of stations in these corridors and the relatively short length suggest that the combined services (HST + Regional Rail Overlay) could require four tracks for passenger services throughout much of the HST alignment for this alternative. Even so, the Plan would also include improvement in the South County corridor (along US 101 from San Jose to Monterey-Salinas).

The Plan outcome "with High-Speed Rail via Pacheco Pass" also would present the opportunity for shared infrastructure and shared costs with the statewide HST system in several of the corridors under investigation: the South County, the East Bay, Peninsula, Transbay, and Central Valley. With this Plan alternative, a considerable level of improvement in the "Tri-Valley" corridor (Altamont Pass) would also occur.

B. CUMULATIVE GROWTH PROJECTIONS

California's population has grown from 20 million to more than 36 million people over the last 30 years. At the same time, more than 10 million additional jobs have been created in California. As of 2005, California was estimated to have about 36.1 million people and 20.9 million jobs. Table 3.17-2 lists Year 2005 population and employment and 2030 projections as well as estimates of 2002 and 2030 urbanization. Data are presented for major regions in California as well as individual counties in the Bay Area to Central Valley region. As expected, the Bay Area counties have a higher total population than those in the Central Valley in 2005 and 2030, but the 64% growth rate for the Central Valley is more than 33% higher and exceeds the 44% growth rate for the 11-county core study area and the state. Employment also is projected to increase substantially by 2030 in both the Bay Area and Central Valley counties, exceeding the growth rate for the state. Urbanization is projected to increase by 392,000 ac (158,700 ha) by 2030 in the 11-county core study area, with 68% of this occurring in the Central Valley counties.

Table 3.17-2
Population, Employment (2005-2030) and Urbanization (2002-2030) Trends

County	Population			Employment			Urbanized Area		
	2005 Conditions	2030 No Project	Growth Rate	2005 Conditions	2030 No Project	Growth Rate	Year 2002 Acres (ha)	2030 No Project Acres (ha)	Growth Rate
Alameda County	1,451,065	2,038,482	40.5%	953,937	1,247,413	30.8%	141,654 (57,327)	186,683 (75,551)	31.8%
Contra Costa County	1,017,644	1,543,053	51.6%	508,854	763,445	50.0%	142,467 (57,656)	183,869 (74,412)	29.1%
San Francisco County	741,025	796,208	7.4%	779,357	975,823	25.2%	23,277 (9,420)	30,013* (12,146)	28.9%
San Mateo County	701,175	814,065	16.1%	522,830	717,526	37.2%	70,869 (28,681)	80,304 (32,499)	13.3%
Santa Clara County	1,705,158	2,152,963	26.3%	1,323,920	1,769,498	33.7%	184,481 (74,659)	207,833 (84,110)	12.7%
Study Area—Bay Area	***5,616,067***	***7,344,771***	***30.8%***	***4,088,898***	***5,473,705***	***33.9%***	***562,748*** (227,744)	***688,702*** (278,718)	***22.4%***
Fresno County	878,089	1,297,476	47.8%	435,769	589,226	35.2%	96,977 (39,247)	150,223 (60,795)	54.9%
Madera County	142,530	219,832	54.2%	56,892	91,364	60.6%	23,255 (9,411)	36,366 (14,717)	56.4%
Merced County	242,249	437,880	80.8%	87,365	115,054	31.7%	31,712 (12,834)	60,455 (24,466)	90.6%
Sacramento County	1,363,423	2,293,028	68.2%	805,978	1,259,792	56.3%	157,101 (63,579)	237,818 (96,245)	51.4%
San Joaquin County	664,796	1,229,757	85.0%	274,155	368,745	34.5%	74,250 (30,049)	145,776 (58,996)	96.3%
Stanislaus County	505,492	744,599	47.3%	224,491	316,686	41.1%	55,426 (22,431)	74,267 (30,056)	34.0%
Study Area—Central Valley	***3,796,579***	***6,222,572***	***63.9%***	***1,884,650***	***2,740,867***	***45.4%***	***438,721*** (177,550)	***704,905*** (285,275)	***60.7%***
Core Study Area	***9,412,646***	***13,567,343***	***44.1%***	***5,973,548***	***8,214,572***	***37.4%***	***1,001,469*** (405,295)	***1,393,607*** (563,993)	***39.2%***
Statewide Total	**36,154,147**	**48,110,671**	**33.1%**	**20,903,134**	**28,617,864**	**36.9%**			

Sources: U.S. Bureau of the Census; MTC/California High-Speed Rail Travel Demand Model; Cambridge Systematics, Inc, 2007

*Note: Projected increases in urbanized area for San Francisco County are a function of the average densities used to calculate employment acreage. Since "greenfield" land is not available in San Francisco County, employment growth will need to be accommodated through densification and infill rather than increases in urbanized area size implied in this table.

3.17.4 Analysis of Cumulative Impacts

The following analysis describes the potential range of impacts from the HST Network Alternatives to contribute to cumulative impacts related to the environmental topics of Chapter 3 when considering past, present, and reasonably foreseeable future projects. The environmental topics are discussed herein in the same order as they appear in Chapter 3. The impacts of growth potentially induced by the proposed project are addressed in Chapter 5, "Economic Growth and Related Impacts." These potential secondary impacts were considered in the cumulative impacts analysis.

A. TRAFFIC AND CIRCULATION AND TRAVEL CONDITIONS

California's intercity travel network consists of three main components: highways, airports, and rail. As discussed in Section 3.2, "Travel Conditions," automobiles and air transportation carry more than 99% of intercity trips in California. The urban areas of San Francisco and Los Angeles experience some of the most severe highway congestion and travel delays in the country. Between 1990 and 2003, the vehicle miles of travel (VMT) (vehicle kilometers of travel [VKT]) on only the state highway system increased by almost 37 billion mi (60 billion km), a 26% increase (California Department of Transportation 2007). Between 2005 and 2030, the statewide vehicle miles of travel on all roadways is projected to increase by more than 68% to over 550 billion miles (890 billion km) in 2030 (California Department of Transportation 2006). In addition, California airports generally experience the highest average air travel delays in the nation (Hansen et al. 2002). Although the main contributors to congestion are local and commuter highway trips and transcontinental and international flights (such as in San Francisco), intercity trips compete for the limited capacity on overburdened facilities.

The study area for the cumulative analysis of traffic and circulation was identified to be the study region, Bay Area to Central Valley. This included major intercity highways, roadways, passenger transportation services, and intersections around stations within 1 mi (1.6 km) of suburban station options and 0.25 mi (0.40 km) of downtown station options.

<u>No Project Alternative</u>

As described in Chapter 3 (Sections 3.1 and 3.2), the program-level impact analysis of traffic and circulation and travel conditions focused on traffic and LOS analysis of intercity highway segments, primary highway/roadways accessing proposed HST stations, and primary highway/roadways accessing airports and potential impacts on transit, goods movement, and parking at proposed stations. Impacts on travel conditions included analysis of travel time, reliability, safety, connectivity, sustainable capacity, and passenger cost. Intercity travel in California is forecasted to increase up to 63% between 2000 and 2030, from 550 million trips to more than 896 million trips. An estimated 86% of these trips will be made by automobile, as stated in the purpose and need chapter of this Program EIR/EIS (Chapter 1). More than 42% of the intercity travel market forecast for 2030 between the state's major metropolitan areas and more than 62% of the projected intercity ridership of the proposed statewide HST system would have a trip-end (either origin or destination) in the Bay Area to Central Valley study area. More than two-thirds of the 18 highway segments analyzed in this study would operate at unacceptable conditions (LOS F) under the No Project Alternative. The expected increase in the number of autos on the highways by 2030 also would result in significant travel delays and congestion under the No Project Alternative, which would have significant potential impacts on the state's economy and quality of life. Under the No Project Alternative, there would be adverse effects related to traffic and LOS on intercity highway segments, primary highway/roadways accessing proposed HST stations, and primary highway/roadways accessing airports. There would be adverse impacts on transit, goods movement, and parking. Therefore, under the No Project Alternative, the cumulative impact related to traffic and circulation would be significant when considering past, present, and reasonably foreseeable future projects in the study area (See Section 3.1).

HST Network Alternatives

Compared to the No Project Alternative in 2030, the proposed statewide HST system would result in a reduction of automobile travel of from 12 to 23 billion miles (19 to 37 billion km) annually, depending on network alternative as discussed in Section 3.2, "Travel Conditions." This outcome would benefit intercity highways within the study region and reduce travel delays on the affected highways and on surface streets leading to and from intercity highways. Therefore, implementation of the HST Network Alternatives would not lead to a considerable contribution to the cumulative impact related to highway and airport use but could be a considerable contribution to the cumulative impact related to surface streets leading to and from proposed stations.

Program mitigation strategies, as discussed in Section 3.1, could be developed in consultation with state, federal, regional, and local governments and affected transit agencies to improve the flow of intercity travel on the primary routes and access to the proposed stations. Regional strategies would include coordination with regional transportation planning and intelligent transportation system strategies. Local improvements could employ TSM/signal optimization; local spot widening of curves; and major intersection improvements.

B. AIR QUALITY

As stated in Section 3.3, "Air Quality," pollution sources in the two air basins directly affected by the proposed project account for about 30% of the total statewide criteria pollutant emissions. Overall, emissions in the San Francisco Bay Area Air Basin and San Joaquin Valley Air Basin have been declining for the past 20 years despite population growth and increases in vehicular travel. This decline is a result of new controls, rules, and more stringent emissions standards. The one exception to improvement has been PM10. PM10 emissions are predicted to increase through 2010 as a result of growth in emissions from areawide sources, primarily fugitive dust sources. An additional growing environmental concern is global climate change, and the transportation sector is responsible for about 40% of California's greenhouse gas emissions, and up to 50% in the Bay Area.

The study area for the cumulative analysis of air quality was identified to be the San Francisco Bay Area Air Basin and San Joaquin Valley Air Basin, as well as the state as a whole. CO_2 emissions are only calculated on a statewide level.

No Project Alternative

The program-level impact analysis of air quality described in Section 3.3, "Air Quality," focused on the potential statewide, regional, and localized impacts related to pollutant burdens occurring from highway vehicle miles traveled, number of plane operations, number of train movements, and power requirements. The analysis of air quality considers emissions of projected regional growth by the CARB for eight criteria pollutants (CO, SO_x, HC, NO_x, O_3, PM10, PM2.5, and Pb) in the two air basins potentially affected, and therefore includes past, present, and reasonably foreseeable projects/actions and population growth as part of the No Project Alternative. CO_2, the primary greenhouse gas, is projected to increase 38% statewide from existing conditions. As noted above, the analysis is structured to estimate the potential impacts on air quality on the local and regional levels in two air basins directly affected by the project alternatives as well as statewide. Under the No Project Alternative, the cumulative impact related to air quality would be significant when considering past, present, and reasonably foreseeable future projects in the study area (See Section 3.3).

HST Network Alternatives

It is estimated that the proposed HST Network Alternatives would be able to accommodate between 88 and 117 million people annually for intercity trips, as discussed in Section 3.2, "Travel Conditions." Intercity passengers using the HST system otherwise would use the roadways and airports, and the result is a potential reduction of automobile travel from 22 to 32 billion miles (36 to 52 billion km) annually, and a reduction in emissions because of the reduced number of flights (19.3 to 20.1 million air trips would shift to HST annually, as discussed in Section 3.3). Overall, pollutants would decrease statewide compared to the No Project Alternative: CO 5.2% to 5.3%, PM10 5.4% to 5.5%, PM2.5 5.1% to 5.6%, NO_X 4.2%, and total organic gases 5.2% to 5.3%. Therefore, the HST Network Alternatives would result in an air quality benefit. The benefit could increase if the HST ridership increased beyond the levels assumed in this document. However, as described in Section 3.3, there may be localized air quality impacts from the HST Network Alternatives.

The HST Network Alternatives would also reduce greenhouse gas emissions (CO_2) statewide by 0.9% to 1.4%. The proposed HST system would result in beneficial impacts related to greenhouse gases and global climate change. Any additional carbon entering the atmosphere, whether by emissions from the project itself or removal of carbon sequestering plants (included agricultural crops), would be more than offset by the beneficial reduction of carbon resulting from the project due to a reduction in automobile vehicle miles traveled (mobile sources) and reduction in the number of airplane trips.

The potential local air quality impacts of the HST Network Alternatives, in combination with the air quality impacts of other projects identified for this cumulative impact analysis (Appendix 3.17-A) and those projects considered in the state implementation plan for air quality, could contribute considerably to cumulative air quality impacts in the two air basins in the study area. Local adverse air quality impacts related to traffic could occur near HST stations. Program-level analysis reviews the potential statewide air quality impacts that would support determination of conformity, as discussed in Section 3.3. At the project level, mitigation strategies to address localized impacts could consider increasing emission controls from power plants supplying power for the HST Network Alternatives; designing the system to use energy efficient, state-of-the-art equipment; promoting increased use of public transit, alternative fueled vehicles, and parking for carpools, bicycles, and other alternative transportation methods; alleviating traffic congestion around passenger station areas; and minimizing construction air emissions.

C. NOISE AND VIBRATION

As noted in Section 3.4, "Noise and Vibration," the noise environment in the study area along the proposed HST alignments and stations generally is dominated by transportation-related sources. The ambient noise in the northern portion of the Bay Area to Central Valley region is dominated by motor vehicle traffic in densely populated areas and along freeways. Other major contributors include Caltrain, Amtrak, and freight rail as well as international airports at San Francisco, Oakland, and San Jose. In the more rural areas of the region, the ambient noise is lower because it is more removed from transportation noise sources.

The study area for the cumulative analysis of noise and vibration was identified to be within 1,000 ft (305 m) of the HST Network Alternatives.

<u>No Project Alternative</u>

Noise and vibration impacts, particularly in growing urban areas and along highway corridors, will continue to increase as population grows and use of highways and airports increases. Therefore, under the No Project Alternative the cumulative impact related to noise and vibration would be significant when considering past, present, and reasonably foreseeable future projects in the study area (See Section 3.4).

<u>HST Network Alternatives</u>

Implementation of the proposed HST Network Alternatives potentially could result in high noise impacts for up to approximately 20 mi (32.4 km) of alignment, depending on network alternative. These potential impacts, when combined with the potential noise impacts of other highway, roadway, and transit expansion projects in the Bay Area to Central Valley region, could locally contribute potential cumulative noise impacts during construction and operation. The same is true for vibration impacts where the network alternatives would potentially result in high vibration impacts for up to approximately 52 mi (84.3 km) of alignment.

The potential impacts of the HST Network Alternatives could be a considerable contribution to cumulative noise and vibration impacts. Program-level mitigation of noise and vibration impacts, as discussed in Section 3.4, "Noise and Vibration," relates to design practices emphasizing the use of tunnels or trenches; use of electric-powered trains, higher quality track interface, and smaller lighter and more aerodynamic trainsets; and grade separations from roadways. At the project level, mitigation strategies to address localized noise and vibration impacts should include treatments for insulation of buildings affected by noise and vibration; sound barrier walls within the right-of-way; track treatments to minimize train vibrations; and construction mitigation (See Section 3.4).

D. ENERGY

As noted in Section 3.5, "Energy," California is the tenth-largest worldwide energy consumer and is ranked second in consumption in the United States, behind Texas. The study area for the cumulative analysis of energy was identified to be the state of California. Of the overall energy consumed in the state, the transportation sector represents the largest portion at 46%. Between 2005 and 2030, the statewide vehicle miles of travel on all roadways are projected to increase by more than 68%, with fuel consumption increasing by more than 61% (California Department of Transportation 2006).

According to the CEC, total statewide electricity consumption grew from 228,038 GWh in 1990 to 272,000 GWh in 2005, approximately 19%. The upward electricity consumption trend throughout the state is anticipated to continue because of growth (California Energy Commission 2006a).

No Project Alternative

As discussed in Section 3.5, the No Project Alternative assumes continued dependence on automobiles and air travel for intercity trips in the state. Compared to 2000, this increase in travel would result in an increase in annual energy consumption by an estimated 56 to 63 million barrels of oil per year, depending on low-end or high-end ridership forecasts. Therefore, under the No Project Alternative, the cumulative impact related to energy consumption would be significant when considering past, present, and reasonably foreseeable future projects in the study area (See Section 3.5).

HST Network Alternatives

The statewide HST system would reduce energy consumption in 2030 by an estimated 22 million barrels of oil annually, depending on HST Network Alterative (a 5% savings compared to the No Project Alternative). This conservative estimate is based on use of average size trains that could be expanded to carry more passengers; the potential energy benefits could be substantially higher if train capacity and ridership were increased. The proposed statewide HST system, regardless of network alternative, would have a beneficial effect on energy consumption in the state and, therefore, would not contribute to cumulative energy impacts.

The statewide HST system would represent a small percentage of generating and transmission capacity required to satisfy projected overall demand in 2030. The electricity requirement of the HST system would be about 794 MW, depending on overall ridership, during peak electricity demand periods in 2030. This represents approximately 0.96% of the projected statewide electricity demand in 2030. The proposed HST system is anticipated to reduce energy consumption overall. Any localized electricity impacts would be avoided through proper planning and design of power distribution systems and their relationship with the overall power grid. Therefore, the statewide HST system's contribution to cumulative electricity demand would be less than significant when considering past, present, and reasonably foreseeable future projects.

Construction-related energy consumption of the statewide HST system would result in a one-time, nonrecoverable energy cost of 22 million barrels of oil spaced over a number of years. Because of the more energy-efficient mode of travel provided by the HST, the energy consumed for construction would be recovered by the energy savings within about one year as noted in Section 3.5, "Energy." Construction of the HST system potentially would represent a significant use of nonrenewable resources. Mitigation strategies to address construction energy use include implementation of a construction energy conservation plan. Therefore, the statewide HST system would result in a considerable contribution to a significant cumulative energy impact when considering past, present, and reasonably foreseeable future projects in the study area (See Section 3.5).

E. ELECTROMAGNETIC FIELDS AND ELECTROMAGNETIC INTERFERENCE

As described in Section 3.6, EMFs exist in the environment both naturally and as a result of human activities. The study area for the cumulative analysis of EMF and EMI was identified to be within 1,000 ft (305 m) of the right-of-way of the HST Network Alternatives.

No Project Alternative

By Year 2030, EMFs along existing roadways and railroad rights-of-way probably would be affected by technological developments and by increases in total energy consumption. For example, general EMF levels along highways may be cumulatively increased by advanced automotive technologies such as collision avoidance systems and automatic vehicle guidance systems, if such technologies are implemented by 2030, and increased reliance on electrically powered automobiles. Improvements to airports may also increase environmental EMFs because of increased use of radar, radio communications, and instrument landing systems. Based on available information, these changes are not likely to cause significant changes in EMF levels, increased human exposures to EMFs, or EMI in the environment. Therefore, under the No Project Alternative there would be no cumulative impact related to EMFs or EMIs when considering past, present, and reasonably foreseeable future projects in the study area.

HST Network Alternatives

The HST Network Alternatives would traverse a range of geographic and land use typologies and could result in potential EMF exposure in urban, suburban, rural, agricultural, and industrial areas. The various components of the HST infrastructure and the trains themselves would be sources of EMFs at both ELF and RF. It is likely that some additional potential for human exposure to EMFs and EMI would occur with the HST Network Alternatives in combination with other proposed projects (potential activities include transmission lines and other electric rail systems); however, although the HST Network Alternatives could cause direct and indirect EMF and EMI impacts, there would not be a considerable contribution to EMF and EMI levels because mitigation included in project-level analysis would include design choices (tunnel, elevated track, physical barriers between track and receptor, or facility site selection) and through shielding to avoid or minimize potential EMF and EMI impacts.

F. LAND USE AND PLANNING, COMMUNITIES AND NEIGHBORHOODS, PROPERTY, AND ENVIRONMENTAL JUSTICE

Even though the population in the San Joaquin Valley grew from 200,000 to 3 million in the 20th century, it underwent much less of a transformation than did the Bay Area. Population growth in the northern San Joaquin Valley was 63% between 1980 and 2000. In this same period the urban to rural share went from 78% urban and 22% rural to 89% urban and 11% rural (Teitz et al. 2005). Since 1990 the rate of land conversion has increased by 21% in the northern San Joaquin Valley (Great Valley Center 2006).

With a population of approximately 7 million in the year 2000, the San Francisco Bay Area (nine-county area) is the fifth most populous metropolitan area in the United States. Only about 18% of the region's approximately 4.8 million ac is developed. Residential uses account for 72% of this developed land. From 1960 to 2000, the region's population has grown by 90%, while jobs increased by 200%. The locations of people and jobs have become much more dispersed with both population growth and jobs occurring in new urban centers on the edge of the region. Since the 1990s, the Bay Area has experienced significant growth, with population increasing by 764,000 and employment by 548,000 jobs. Development has continued as well, with a 5% increase in developed acres (Metropolitan Transportation Commission 2004).

The study area for the cumulative analysis of land use and planning, communities and neighborhoods, property, and environmental justice was identified to be at least 0.25 mi (0.40 km) on either side of the HST Network Alternatives.

<u>No Project Alternative</u>

As described in Section 3.7, the land use and local communities are expected to change between 2006 and 2030 as a result of past, present, and reasonably foreseeable future projects, related to population growth and changes in economic activity in the project study area (see also, Chapter 5, "Economic Growth and Related Impacts"). It is expected that some changes related to land use compatibility, communities and neighborhoods, property, and environmental justice will occur, even though it is assumed that reasonably foreseeable future projects would include typical design and construction practices to avoid or minimize potential impacts and would be subject to a project-level environmental review process to identify potentially significant impacts and to include feasible mitigation measures to avoid or substantially reduce potential impacts. Therefore, under the No Project Alternative the cumulative impact related to land-use compatibility, communities and neighborhoods, property, and environmental justice would be significant when considering past, present, and reasonably foreseeable future projects in the study area.

<u>HST Network Alternatives</u>

The HST Network Alternatives potentially could contribute to cumulative impacts associated with community and neighborhood cohesion and property loss, although most alignment options of the HST Network Alternatives would be within existing railroad right-of-way or adjacent to transportation facilities. Combined with other transit (light rail and commuter rail) and roadway projects considered for this cumulative impact analysis, as listed in Appendix 3.17-A, these localized impacts could contribute to cumulative community/neighborhood impacts. At some locations of the HST Network Alternatives, there would be impacts on adjoining land uses, including residential, parks, commercial business areas, and industrial. Environmental Justice impacts also would occur at select locations along alignments and at stations. These impacts, in combination with other transit extension and roadway projects and when considering past, present, and reasonably foreseeable future projects in the study area, could cause a considerable contribution to potential cumulative impacts on various property types, neighborhoods, and communities.

Program-level mitigation of the HST Network Alternatives' contributions to the land-use compatibility, communities and neighborhoods, property, and environmental justice cumulative impacts, as discussed in Section 3.7, includes design practices to maximize use of existing rights-of-way and incorporating strategies for stations to incorporate transit oriented design, and coordination with cities and counties in each region to ensure that project facilities would be consistent with land use planning processes and zoning ordinances.

G. AGRICULTURAL LANDS

As noted in Section 3.8, the most recent statistics (2004) indicate that California has approximately 26.7 million ac (10.8 million ha) of land in farms, has approximately 77,000 farms, and produces more than 350 different crop types. Six of the top ten California agricultural counties in 2001 were located in the Central Valley (California Department of Food and Agriculture 2005). According to an estimate in a May 2001 report by the University of California Agricultural Issues Center, California lost approximately 497,000 ac (201,000 ha) of farmland to urbanization in the decade between 1988 and 1998, a loss rate of approximately 49,700 ac (20,100 ha) per year (Kuminoff et al. 2001).

The study area for the cumulative analysis of agricultural lands was identified to be the 11 counties potentially affected by the project.

No Project Alternative

As noted in Chapter 5, "Economic Growth and Related Impacts," farmland conversion to non-agricultural use in the 11-county regional area, it is anticipated that by 2030 under the No Project Alternative, the region may have lost nearly 236,000 ac (95,510 ha) of farmland to urban development. This amount would represent a reduction of approximately 1% in the state's 26.7 million ac (10.8 million hectares) of farmland. Therefore, under the No Project Alternative, the cumulative impact related to farmland conversion would be significant when considering past, present, and reasonably foreseeable future projects in the study area.

HST Network Alternatives

Potential direct impacts on farmland from the proposed HST Network Alternatives would vary based on the alignment options selected. The ranges of potential impacts would be 420 ac (170 ha) to 765 ac (309 ha) of prime farmland, 75 ac (30 ha) to 174 ac (70 ha) of unique farmland, 209 ac (84 ha) to 397 ac (161 ha) of farmland of statewide importance, and 51 ac (21 ha) to 181 ac (73 ha) of farmlands of local importance, according to the land designations in the FMMP. The total potential impact on agricultural lands throughout the study area would vary between 755 ac (306 ha) and 1,384 ac (560 ha), depending on the network alternative. Of the nearly 236,000 ac (95,510 ha) projected for conversion to nonagricultural use by 2030, the HST Network Alternatives would represent less than 1% of additional farmland conversion. However, the potential reduction of farmland from the HST Network Alternatives nonetheless could be a considerable contribution to the overall potential cumulative impact on agricultural land throughout the study area and the state.

Program-level mitigation for the HST Network Alternative contributions to the agricultural conversion cumulative impacts, as discussed in Section 3.8, includes design practices to avoid agricultural land conversion through maximizing use of existing rights-of-way to minimize encroachment on additional agricultural lands; using aerial structure or tunnel alignments to allow vehicular and pedestrian traffic access across the alignment; and reducing the new right-of-way to 50 ft in constrained areas. Mitigation measures also may be applied through project-level environmental review and could include securing easements, participating in mitigation banks, increasing permanent protection of farmlands at the local planning level, and coordinating with various local, regional, and state agencies to support farmland conservation programs.

H. AESTHETICS AND VISUAL RESOURCES

Aesthetics and visual resources refer to the natural and human-made features of a landscape that characterize its form, line, texture, and color. The character of the existing landscape has changed in the Bay Area to Central Valley region over time as a result of land uses, including the changes from a natural condition to agriculture, development, and urban growth that have occurred in the past.

The study area for the cumulative analysis of aesthetics and visual resources was identified to be up to 0.25 mi (0.40 km) on each side of the HST Network Alternatives.

No Project Alternative

The aesthetic and visual quality analysis focused on potential impacts on visual resources (particularly scenic resources, areas of historical interest, natural open space areas, and significant ecological areas) along the proposed corridors for the HST Network Alternatives including HST alignments and station sites, as described in Section 3.9. Therefore, under the No Project Alternative, the cumulative impact related to aesthetic and visual resources would be significant when considering past, present, and reasonably foreseeable future projects in the study area.

HST Network Alternatives

The proposed HST Network Alternatives could contribute to both short- and long-term potential cumulative impacts on visual resources (particularly scenic resources, areas of historical interest, natural open space areas, and significant ecological areas). Construction of the system would have short-term potential impacts on visual resources. Construction equipment, staging areas with construction materials, signage, and night lighting would be visible from adjacent properties and roadways during the construction period. Such disruptions could continue for a period of years, potentially a few months to 2 years for most local areas.

Long-term visual changes would result from the introduction of 146 mi (237 km) to 366 mi (593 km) of a new transportation system that would be visible along many major highways and rail corridors connecting the Bay Area and Central Valley. The track, catenary, fencing, soundwalls (where included), elevated guideway (where included), and trains themselves would introduce a linear element into the landscape that could contribute to potential cumulative visual impacts when considered with the strong linear element of the existing highway, rail facilities, and transmission lines that the HST Network Alternatives would parallel for much of the system. HST lines in new corridors either through the Altamont Pass or Pacheco Pass could have significant cumulative effects on visual resources. The significance of the visual change would vary by location, depending on the sensitivity of the landscape and the compatibility with existing landscape features. Therefore, the HST Network Alternatives would result in a considerable contribution to a significant cumulative impact on aesthetic and visual resources when considering past, present, and reasonably foreseeable future projects in the study area (See Section 3.9).

Program-level mitigation of the HST Network Alternatives' contributions to the cumulative impacts on aesthetic and visual resources, as discussed in Sections 3.9, includes design practices that will incorporate local agency and community input during subsequent project-level environmental review in order to develop context sensitive aesthetic designs and treatments for infrastructure. Mitigation measures also may be applied through project-level environmental review and could include design of facilities that integrate into landscape contexts, reducing potential view blockage, contrast with existing landscape settings, and light and shadow effects.

I. PUBLIC UTILITIES

As discussed in Section 3.10, "Public Utilities," electric transmission lines, telecommunications lines, natural gas pipelines, and wastewater and water pipelines exist in the project study area, as do fixed facilities, such as electrical substations, power stations, and wastewater treatment plants. Service providers include both public and private entities.

The study area for the cumulative analysis of public utilities was identified to be at least 100 ft (30 m) on each side of the HST Network Alternatives.

No Project Alternative

Construction of development projects and linear facilities (e.g., highway expansions, rail extensions, pipelines, transmission lines) and other reasonably foreseeable future projects in the study area would create cumulative impacts on public utilities and future land use opportunities because of right-of-way needs and property restrictions associated with these types of improvements, as discussed in Section 3.10. These projects would constrain future development, including future development of public utilities. Therefore, under the No Project Alternative the cumulative impact related to public utilities would be significant when considering past, present, and reasonably foreseeable future projects in the study area.

HST Network Alternatives

Of the utilities identified at the program level, there is potential for conflicts with 33 to 126 utilities, depending on network alternative. The HST Network Alternatives would use a large amount of existing right-of-way, and extensive utility relocation could cause a considerable contribution to cumulative impacts on public utilities. Program-level mitigation of HST Network Alternatives' contributions to the cumulative impacts on public utilities, as discussed in Section 3.10, includes design practices that will avoid potential conflicts, at the project-level analysis, to the extent feasible and practical. At the project level, coordination with utility representatives during construction in the vicinity of critical infrastructure will occur. Design methods to avoid crossing or using utility rights-of-way include modifying both the horizontal and vertical profiles of proposed transportation improvements. Emphasis would be placed on detailed alignment design to avoid potential contribution to cumulative impacts from linear facilities on land use opportunities and to minimize conflicts with existing major fixed public utilities and supporting infrastructure facilities.

J. HAZARDOUS MATERIALS AND WASTES

Cal/EPA's Office of Environmental Health Hazard Assessment (OEHHA), is responsible for developing and maintaining the Environmental Protection Indicators for California (EPIC). The latest update to the environmental indicators relating to solid and hazardous wastes in 2005 shows that the total amount of hazardous waste shipped for treatment, storage, and disposal has fluctuated over the past decade, with the lowest amounts shipped in 1996 and 1997, and the highest in 2001. The amount of hazardous waste generated per unit of economic activity has continued to decline over the past decade. In addition, more than 75% of hazardous wastes shipped off site were destined for disposal in landfills or recycling in 2003. The amount of hazardous waste disposed in landfills has varied over the past 10 years but has increased overall, as has the amount being recycled. The EPIC Update notes that there has been no clear trend related to hazardous material spills or soil cleanup at hazardous waste sites (Cal/EPA 2005).

No Project Alternative

Evaluation of the No Project Alternative assumed that no additional hazardous materials/waste impacts would occur beyond those addressed in the environmental documents for those projects and that any hazardous material/waste impacts would be mitigated as part of those projects. Therefore, under the No Project Alternative, there would be no cumulative impact related to hazardous materials/waste when considering past, present, and reasonably foreseeable future projects in the study area.

HST Network Alternatives

Although past, present, and reasonably foreseeable future projects in the study area could cause cumulative impacts from hazardous materials and waste, implementation of the proposed HST Network Alternatives would not directly or indirectly generate hazardous materials or wastes. As noted in Section 3.11, "Hazardous Materials and Wastes," construction of the network alternatives could encounter hazardous materials/waste sites through ground-disturbing activities. These sites would be handled and disposed of in accordance with regulatory requirements. Therefore, the HST Network Alternatives would not contribute to a cumulative impact related to hazardous materials/waste when considering past, present, and reasonably foreseeable future projects in the study area (See Section 3.11).

K. CULTURAL AND PALEONTOLOGICAL RESOURCES

California's cultural heritage is a result of descendants of more than 300 indigenous tribal groups, European explorers and settlers, miners, and immigrants. Archaeological evidence places prehistoric people in California as early as 8,000 to 12,000 years ago. Each year more archaeological and historic cultural resources are identified and surveyed.

The study area for the cumulative analysis of cultural and paleontological resources was identified to be at least 500 ft (152 m) on each side of the HST Network Alternatives.

No Project Alternative

As described in Section 3.12, "Cultural Resources and Paleontological Resources," it is not realistically feasible to identify or quantify the impacts on cultural and paleontological resources at a program-level analysis. No additional impacts on cultural resources would occur under the No Project Alternative beyond those addressed in environmental documents for those projects. Therefore, under the No Project Alternative, the cumulative impact related to cultural and paleontological resources would be significant when considering past, present, and reasonably foreseeable future projects in the study area.

HST Network Alternatives

As noted in Section 3.12, the HST Network Alternatives have the potential to affect 78 to 222 known archaeological and historic resources, depending on network alternative. Potential impacts likely would occur in areas that cross formations with paleontological sensitivity and in areas where the proposed HST alignments and stations are adjacent to existing rail corridors, because these older corridors tend to be surrounded by historical structures and districts. In addition, the HST Network Alternatives could contribute to potential cumulative impacts on historical districts combined with other projects over time. Therefore, the HST Network Alternatives would contribute to cumulative impacts on archaeological resources, historical structures, and paleontological resources when considering past, present, and reasonably foreseeable future projects in the study area (Section 3.12).

Program-level mitigation for the cumulative impacts on cultural and paleontological resources, as discussed in Section 3.12, relate to avoidance measures through identification of sensitive resources in the project-level analysis and project design refinement, and careful selection of alignments. At a program level, continued consultation with the SHPO would occur to define and describe general procedures to be applied in the future for fieldwork, method of analysis, and development of specific mitigation measures to address effects and impacts on cultural resources, resulting in a programmatic agreement among the Authority, FRA, and the SHPO. In addition, consultation with Native American tribes would occur. Subsequent project-level field studies to verify the location of cultural resources would offer opportunities to avoid or minimize direct impacts on resources, based on the type of project, type of property, and impacts on the resource (see Section 3.12 for more detail on particular mitigation measures that would be applied through project-level environmental analysis).

L. GEOLOGY AND SOILS

The study area for the cumulative analysis of geology and soils was identified to be at least 200 ft (60 m) on each side of the HST Network Alternatives.

No Project Alternative

As described in Section 3.13, "Geology and Soils," although it is expected that planned projects in the study area would incorporate safeguards as part of the development, design, and construction process, it would not be possible to eliminate or mitigate all geologic hazards. Therefore, under the No Project Alternative, the cumulative impact related to geology and soils would be significant when considering past, present, and reasonably foreseeable future projects in the study area.

HST Network Alternatives

The HST Network Alternatives could affect slope stability in various proposed locations of cut and fill. Some construction activities, such as placing a building or fill material on top of a slope or performing additional cuts at the toe of a slope, can decrease the stability of the slope. These activities, when combined with similar activities from other projects in the region, could contribute considerably to the cumulative impact on geology and soils related to slope stability in areas susceptible to slope failure. Pumping or construction dewatering associated with the HST Network Alternatives in segments with tunneling or extensive earthwork potentially would affect the ground surface and could result in subsidence at some locations. This could cause a considerable contribution to cumulative impacts on geology and soils related to subsidence if other projects under construction in the area also needed to dewater from the same drainage basin.

Program-level mitigation of the HST Network Alternatives' contributions to the cumulative impacts on geology and soils, as discussed in Section 3.13, includes design practices to prepare extensive alignment studies to ensure that potential effects related to major geologic hazards such as major fault crossings, oil fields, and landslide areas, will be avoided. Mitigation for potential impacts will be developed on a site-specific basis, based on detailed geotechnical studies to address ground shaking, fault crossings, slope stability/landslides, areas of difficult excavation, hazards related to oil and gas fields, and mineral resources.

M. HYDROLOGY AND WATER RESOURCES

California has dealt with the limitations resulting from its natural hydrology and grown in population by developing a system of reservoirs, canals, and pipelines under federal, state, and local projects. About 30% of California's water supply need is met by groundwater. Groundwater use increases to about 40% statewide and 60% or more in some regions during dry years. Approximately 40% to 50% of the state's population relies on groundwater for part of their water supply. It is estimated that groundwater overdraft[3] in the state is between 1 million and 2 million acre-feet annually. Overdraft can result in increased water production costs, land subsidence, water quality impairment, and environmental degradation. (California Department of Water Resources 2003.)

As noted in Section 3.14, "Hydrology and Water Resources," the study area includes portions of the Central Valley and San Francisco Bay regions of the RWQCBs. The Central Valley Region is the state's largest and includes 11,350 miles (18,400 km) of streams, 579,110 ac (234,354.4 ha) of lakes, and the largest contiguous groundwater basin in California. The San Francisco Region includes San Francisco Bay and estuaries. In the Central Valley and San Francisco Regions, there were 204 (89 in San Francisco Bay Region and 115 in Central Valley Region) Clean Water Act Section 303(d) impaired waters in 2006 (State Water Resources Control Board 2006).

As noted in Section 3.14, "Hydrology and Water Resources," floodplains are important because they provide floodwater storage and attenuate the risk of downstream flooding, typically provide important

[3] Overdraft is the condition of a groundwater basin in which the amount of water withdrawn by pumping over the long term exceeds the amount of water that recharges the basin.

habitat for native species, improve water quality, and may provide locations for groundwater recharge. Historically, people have been attracted to bodies of water as places for living, business, and recreation. This pattern of development has continued throughout California's history. Growth in floodplains alters the floodplain and the dynamics of flooding, and buildings and infrastructure are damaged during flood events. California has built a series of flood control facilities to minimize flooding and contain floodwaters. California's Central Valley flood control facilities are deteriorating, and at the same time the Central Valley's population growth is moving into areas that are vulnerable to flooding (California Department of Water Resources 2005).

The study area for the cumulative analysis of hydrology and water resources was identified to be at least 200 ft (60 m) on each side of the HST Network Alternatives.

<u>No Project Alternative</u>

As described in Section 3.14, "Hydrology and Water Resources," although it is expected that impacts on hydrologic and water resources from planned projects in the study area would be limited through incorporation of typical design and construction practices to meet permit conditions, it would not be possible to eliminate or mitigate all impacts on hydrology and water resources. Therefore, under the No Project Alternative, the cumulative impact related to hydrology and water resources would be significant when considering past, present, and reasonably foreseeable future projects in the study area.

<u>HST Network Alternatives</u>

The proposed HST Network Alternatives would encroach significantly into sensitive hydrologic resources, including approximately 178 ac to 573 ac (72 ha to 232 ha) of floodplains, 14,400 linear ft to 30,300 linear ft (4,389 linear m to 9,235 linear m) of streams, 2 ac to 42 ac (0.8 ha to 17 ha) of lakes and/or San Francisco Bay, and 1,094 ac to 2,900 ac (493 ha to 1,174 ha) of groundwater areas. In addition, the network alternatives potentially would affect between 14 and 40 polluted 303(d) waters. In addition to direct impacts, potential indirect impacts of the proposed project were evaluated as part of the cumulative impact analysis. The HST Network Alternatives could indirectly affect 12.3 miles to 26.1 miles (20 km to 42.3 km) of streams, canals, and channels. The amount of impervious surface associated with the HST Network Alternatives would be minimized because much of the HST facilities would consist of permeable fill, elevated structures, and/or tunnels. Design characteristics such as a relatively narrow alignment width and columns required to support HST structures also would minimize hydrologic impacts. Indirect floodplains impacts associated with the HST Network Alternatives range from 561 ac to 3,411 ac, while indirect impacts to water bodies, including lakes and San Francisco Bay, range from 7.6 ac to 253 ac. Through avoidance and design, the HST Network Alternatives would minimize impacts on floodplain and surface water resources; however, implementation of the HST Network Alternatives could cause a considerable contribution to potential cumulative impacts on hydrologic resources when considering past, present, and reasonably foreseeable future projects in the study area (See Section 3.14).

Program-level mitigation of the HST Network Alternatives' contributions to the cumulative impacts on hydrology and water resources, as discussed in Section 3.14, includes design practices to maximize use of existing rights-of-way to minimize potential impacts on water resources. Avoidance and minimization measures would be incorporated into the development, design, and implementation phases at project-level environmental analysis. In addition, close coordination will occur with the regulatory agencies to develop specific design and construction standards for stream crossings, infrastructure setbacks, erosion control measures, sediment-controlling excavation/fill practices, and other BMPs. In addition, mitigation strategies specific to reconstruction, restoration, or replacement of the resource will occur, in close coordination with state and federal resource agencies, related to floodplains; surface waters, runoff, and erosion; and groundwater.

N. BIOLOGICAL RESOURCES AND WETLANDS

The analysis of potential impacts on biological resources and wetlands includes special-status plant and wildlife species, marine and anadromous fish habitat, riparian corridors, wildlife movement corridors, jurisdictional wetlands, and waters of the U.S. that would require a permit under Section 404 of the Clean Water Act (and also would require documentation of compliance with EPA's Section 404b(1) Guidelines).

California has about 10% to 15% of the wetlands that existed before settlement by Europeans (California Resources Agency, Wetlands Information System 1998a). Estimates of wetlands that existed historically in California range from 3 to 5 million ac (1.2 to 2.0 million ha). The current estimate of wetland acreage in California is approximately 450,000 ac (182,115 ha); this represents an 85 to 90% reduction (California Resources Agency, Wetlands Information System 1998b). The Central Valley region of the state contains the highest amount of wetlands. The region of the study area once had wetlands extending over approximately 4 million ac that have diminished over the years to around 300,000 ac (121,410 ha). Only 5% of the state's coastal wetlands remain intact (California Resources Agency, Wetlands Information System 1998a). Also in the study area is San Francisco Bay, which has undergone rapid, large-scale, permanent changes driven by population migration attracted to the region's natural setting and economic opportunities. This growth and urbanization have resulted in the loss of wetlands and impacts on biological resources (U.S. Geological Survey 2006).

Wildlife movement corridors and habitat linkages in the study area primarily would be in three of nine regions identified in the California Wildlife Action Plan (California Department of Fish and Game 2006) and Missing Linkages: Restoring Connectivity to the California Landscape (Penrod et al. 2001). The effects would occur primarily in the central portion of the Central Valley and Bay Delta regions and the northern tier of the Central Coast region. Natural habitats in these regions have been converted to a variety of different land uses, including weedy pastureland, dryland farming, irrigated cropland, relatively permanent orchards and vineyards, large dairies, rural residential, and high-density urban. CDFG estimates that the overall Central Valley region has lost 99% of its historical native grasslands and valley oak savanna; 95% of its wetlands, and 89% of its riparian woodlands (California Department of Fish and Game 2006). In the Bay area, it is estimated that 88% of the original moist grasslands, 84% of the riparian forest, and 80% of the tidal marshes have been converted or substantially altered. In addition to removing and fragmenting habitats, the land uses in the regions also have introduced structures that impede or prevent wildlife movement within and between the remaining natural habitats. These structures include roads, canals, and powerlines that affect a wide variety of animals as well as dams, dikes, and levees that block fish migration. In the central portion of the Central Valley and Bay Delta regions and the northern tier of the Central Coastal region, many of the remaining wildlife movement corridors follow the riparian corridors along major creeks and rivers.

The study area for the cumulative analysis of biological resources and wetlands was identified to be at least 0.25 mi (0.40 km) from the HST Network Alternatives. The direct and indirect impacts of the proposed project were evaluated as part of the cumulative impact analysis. Direct impacts for aquatic and biological resources were identified to be within the HST right-of-way footprint. Direct impacts for aquatic and biological resources can be either permanent or temporary. Examples of permanent impacts include removal or altering of a resource either during the construction phase (temporary) or by permanent project features. Indirect impacts, also referred to as secondary impacts, are those caused by the project that may occur either later in time or some distance from the project site, but are still reasonably foreseeable. Examples include downstream effects, implementation of mitigation measures for other resources that may result in secondary impacts, and/or the growth that would be caused or accelerated by the project. The quantities identified in this analysis should be viewed as areas where direct or indirect impacts could potentially occur and not as a specific or worst-case impact amount. Indirect impacts as a result of construction of the

HST system and other projects may also occur. This includes air quality (dust can affect certain species), lighting (especially for nearby nocturnal species), and runoff from activities involving soil disturbance (downstream water quality, erosion, sedimentation, and water temperature that could affect wetland or aquatic species). Construction can also set up conditions that favor the introduction or spread of invasive species.

No Project Alternative

As described in Section 3.15, "Biological Resources and Wetlands," although it is expected that impacts on biological resources and wetlands from planned projects in the study area would be limited through incorporation of typical design and construction practices to meet permit conditions, it would not be possible to eliminate or mitigate all impacts on biological resources and wetlands. This would be in addition to existing biological habitat losses that have occurred as well as the estimated 90% of wetlands already lost in California because of past development as noted above. Therefore, under the No Project Alternative, the cumulative impact related to biological resources and wetlands would be significant when considering past, present, and reasonably foreseeable future projects in the study area.

HST Network Alternatives

The additional land required and the linear features added under HST Network Alternatives could cause a considerable contribution to the potential for cumulative impacts on biological resources and wetlands throughout the study area (1,000 ft [305 m] on either side of alignment centerlines and around stations in urbanized areas, 0.25 mi [0.40 km] on either side of alignment centerlines and around stations in undeveloped areas, and 0.50 mi [0.81 km] on either side of alignment centerlines and around stations in sensitive areas).

The HST Network Alternatives potentially would have impacts on sensitive biological resources and wetlands when combined with other foreseeable projects (Appendix 3.17-A) in the study area. Portions of the HST Network Alternatives would use existing transportation right-of-way and therefore would minimize direct disturbance of sensitive habitats. The potential for indirect noise effects on biological resources is addressed in Section 3.4, "Noise and Vibration." Although there is a potential for cumulative impacts on biological resources from increased noise from projects in specific areas, the information for assessing this potential additive effect cannot be considered at this program level of analysis and would be addressed when site-specific analysis is completed in a subsequent phase of evaluation.

The additional embankments and bridges associated with the proposed HST Network Alternatives potentially would result in direct impacts on approximately 10.7 ac to 56.1 ac (4.3 ha to 22.7 ha) of wetlands and 74 to 129 special-status species throughout the study area. Indirect impacts on wetlands could be between 499 ac and 3,499 ac (202 ha and 1,416 ha). Wildlife movement corridors may be affected where the HST Network Alternatives would not be in an existing rail or highway corridor and would traverse a natural area (e.g., Pacheco Pass for the Pacheco Pass Network Alternatives) or where there is habitat use in existing rights-of-way (where wildlife movement occurs across roads and rail lines where fences are not obstructing movement). Therefore, the HST Network Alternatives would result in a considerable contribution to a significant cumulative impact on biological resources and wetlands when considering past, present, and reasonably foreseeable future projects in the study area (See Section 3.15).

Program-level mitigation of the HST Network Alternatives' contributions to the cumulative impacts on biological resources and wetlands, as discussed in Section 3.15, includes design practices to maximize use of existing rights-of-way to minimize potential impacts on biological resources and wetlands. Avoidance and minimization measures would be incorporated into the development, design, and implementation phases at project-level environmental analysis. In addition, close coordination will occur with the regulatory agencies to develop specific design and construction standards for stream crossings, infrastructure setbacks, monitoring during construction, and other BMPs. In addition, mitigation strategies specific to reconstruction, restoration, or replacement of the resource will occur, in close coordination with state and federal resource agencies, related to wetlands. The HST Network Alternatives generally would be located within or adjacent to existing transportation corridors or would be in tunnel or elevated through mountain passes and sensitive habitat areas. During project-level environmental review, field studies would be conducted to verify the location, in relation to the HST alignments, of sensitive habitat, wildlife movement corridors, and wetlands. These studies would provide further opportunities to minimize and avoid potential impacts on biological resources through changes to the alignment plan and profile in sensitive areas. For example, the inclusion of design features such as elevated track structures over drainages and wetland areas and wildlife movement corridors would minimize potential impacts on wildlife and sensitive species.

O. SECTION 4(f) AND 6(f) RESOURCES (PUBLIC PARKS AND RECREATIONAL RESOURCES)

The study area for the cumulative analysis of Section 4(f)/6(f) resources was identified to be at least 900 ft (274 m) on each side of the HST Network Alternatives.

No Project Alternative

As discussed in Section 3.16, Section 4(f) and 6(f) resources include publicly owned parklands, recreation lands, wildlife and waterfowl refuges, and historic sites that are covered by Section 4(f) of the DOT Act of 1966 and Section 6(f) of the Land and Water Conservation Fund Act of 1965. Although it is expected that impacts on 4(f) and 6(f) resources from planned projects in the study area would be limited through incorporation of typical design and construction practices to avoid these resources, it would not be possible to eliminate or mitigate all impacts. Therefore, under the No Project Alternative, the cumulative impact related to Sections 4(f) and 6(f) resources would be significant when considering past, present, and reasonably foreseeable future projects in the study area.

HST Network Alternatives

The proposed HST Network Alternatives could contribute to the cumulative impact on parkland resources. The impacts on parkland resources from the HST Network Alternatives would be minimized, because it is possible to plan the HST alignment, stations, and other facilities with the intent to avoid or minimize potential effects by routing the train around, above, or below an identified resource. Depending on the network alternative selected, the HST Network Alternatives could result in impacts on 8 to 46 parkland resources. This includes potential impacts on the Don Edwards San Francisco Bay National Wildlife Refuge for network alternatives that extend across the Bay at Dumbarton Bridge and the Upper Cottonwood Creek Wildlife Area for the Pacheco Pass Network Alternatives (GEA North Alignment Alternative would directly impact the San Luis National Wildlife Refuge and the Great Valley Grasslands State Park). When combined with the impacts of other highway and transit expansion projects in the region, the potential impacts of the HST Network Alternatives could cause a considerable contribution to potential cumulative impacts on parklands and recreational resources throughout the study area.

Program-level mitigation of the HST Network Alternatives' contributions to the cumulative impacts on 4(f) and 6(f) resources, as discussed in Section 3.16, includes design practices to maximize use of existing rights-of-way to minimize potential impacts on 4(f) and 6(f) resources. Avoidance and minimization measures would be incorporated into the development, design, and implementation phases at project-level environmental analysis. In addition, close coordination will occur with the agency having jurisdiction over the resource and the regulatory agencies to develop specific design and construction standards for stream/Bay crossings, infrastructure setbacks, monitoring during construction, and other BMPs. In addition, mitigation strategies specific to reconstruction, restoration, or replacement of the resource will occur, in close coordination with state and federal resource agencies, related to wetlands. During project-level environmental review, field studies would offer the opportunity to avoid or minimize direct or indirect impacts on parklands by making adjustments in the alignment plan or profile. In the event that, during project-level environmental analysis, it is determined that the alternative cannot avoid being located near 4(f) and 6(f) lands, mitigation related to natural, cultural, aesthetic, and recreational impacts would be incorporated, including compensation for temporary and permanent loss of park and recreation uses; inventory and recordation of historic features removed; provision of alternative shuttle access for park visitors; and restoration of park features post construction.

3.17.5 Mitigation Strategies

The mitigation strategies described below are further discussed in Chapter 3 of this program EIR/EIS for each topic area. These mitigation strategies were identified for the program-level analysis to avoid, minimize, or reduce potentially significant environmental impacts, including cumulative impacts. Further environmental analyses tiering from this EIS/EIR will be conducted for the project-level document, as required by NEPA and CEQA. At the Tier 2 project level, mitigation strategies identified in the program document will be used as starting points to determine their applicability to a specific project and to develop refined and/or additional mitigation measures for significant adverse impacts identified in the project-specific analysis. Because all the potential actions and impacts and their significance for tiered projects cannot be anticipated at a programmatic level, future project-level documents will need to select those strategies applicable to the impacts associated with the specific location and type of action. For purposes of CEQA, the mitigation strategies in this final program EIS/EIR also serve as mitigation measures at a programmatic level. In addition, the Authority has committed to design practices and policies that will be used to develop alignment alternatives at the project-level to avoid impacts and to help shape specific mitigation measures.

Resource Area	Impact Area	Mitigation Measure
Traffic and circulation	Traffic and circulation	Require that HST system stations serve as multi-modal transportation hubs providing easy connection to local/regional bus, rail, and transit services, as well as providing bicycle and pedestrian access.
		Require the HST system to be grade-separated from all roadways to allow vehicular traffic to flow without impediment from the HST system.
		Work with local and regional agencies to develop and implement transit-oriented development strategies, as described in Chapter 6, around HST stations.
		Work with local and regional agencies to identify, plan, coordinate, and implement traffic flow improvements around HST station locations during project-level planning. Such improvements may include: a. a construction phasing and traffic management plan for construction periods; b. improving capacity of local streets with upgrades in geometrics such as providing standards roadway lane widths, traffic controls, bicycle lanes, shoulders, and sidewalks; c. modifications at intersections, such as signalization and/or capacity improvements (widening for additional left-turn and/or through lanes), and turn prohibitions; d. signal coordination and optimization (including retiming and rephasing); e. designation of one-way street patterns near some station locations; f. truck route designations; and g. coordination with Caltrans regarding nearby highway facilities.
		Work with public transportation providers to coordinate services and to increase service and/or add routes, as necessary, to serve the HST station areas.
		Avoid parking impacts by developing and coordinating implementation at the project-level of parking improvement strategies consistent with local policies, including shared parking, offsite parking with shuttles, parking and curbside use restrictions, parking permit plans for neighborhoods near HST stations, and other parking management strategies.
Air quality	Localized air quality impacts due to congestion/traffic near HST stations	Assure that HST stations are multi-modal hubs and include appropriate parking.
		Coordinate with local and regional public transportation providers to increase opportunities for connection between the HST system and other public transportation services.
		Work with local and regional agencies to implement local street and roadway improvements, including various traffic flow improvements and congestion management techniques, and parking management strategies to reduce localized pollution from traffic related to the HST system.
	Short-term air quality impacts due to construction	Water all active construction areas at least twice daily.
		Require that all trucks hauling soil, sand, and other loose materials be covered or maintain at least 2 feet of freeboard.
		Pave, apply water three times daily, or apply nontoxic soil stabilizers on all unpaved access roads, parking areas, and staging areas at active construction sites.
		Sweep daily (with water sweepers) all paved access roads, parking areas, and staging areas at active construction sites.
		Sweep nearby streets daily (with water sweepers) if visible soil materials from HST system construction are carried onto adjacent public streets.
		Hydroseed or apply nontoxic soil stabilizers to inactive construction areas (previously graded areas inactive for 10 days or more).
		Enclose, cover, water twice daily, or apply nontoxic soil binders to exposed stockpiles of dirt, sand, etc.
		Limit traffic speeds on unpaved roads to 15 mph.

Resource Area	Impact Area	Mitigation Measure
		Install sand bags or other erosion control measures to prevent silt runoff to public roads.
		Replant vegetation in disturbed areas as quickly as possible.
		Use alternative fuels for construction equipment when feasible.
		Minimize equipment idling time.
		Maintain properly tuned equipment.
Noise	Increased noise from train operations and construction	Grade separations to eliminate grade crossing related noise.
		Noise barriers, such as sound walls, where there are severe noise impacts.
		Require noise reduction in HST equipment design and track structures design.
		Use of enclosures or walls to surround noisy equipment, and installation of mufflers on engines; substituting quieter equipment or construction methods, minimizing time of operation, and locating equipment farther from sensitive receptors.
		Where not already included, consider placing alignment sections in tunnel or trenches or behind berms where possible and where other measures are not available to reduce significant noise impacts.
		Suspend construction between 7:00 pm and 7:00 am and/or on weekends or holidays in residential areas where there are severe noise impacts.
		In managing construction noise, take into account local sound control and noise level rules, regulations, and ordinances.
		Ensure that each internal combustion engine is equipped with a muffler of a type recommended by the manufacturer.
		Specify the use of the quietest available construction equipment where appropriate and feasible.
		Turn off construction equipment during prolonged periods of nonuse.
		Require contractors to maintain all equipment and to train their equipment operators.
		Locate noisy stationary equipment away from noise sensitive receptors.
	Exposure to ground-borne vibration	Specify the use of train and track technologies that minimize ground vibration such as state of the art suspensions, resilient track pads, tie pads, ballast mats, or floating slabs.
		Phase construction activity, use low impact construction techniques, and avoid use of vibrating construction equipment where possible to avoid vibration construction impacts.
Energy	Increased energy use and electricity demand with the HST system	HST stations will be multi-modal hubs providing linkage for various transportation modes, which will contribute to increased efficiency of energy use for intercity trips and by commuters, and the stations will be required to be constructed to meet Title 24 California Code of Regulations energy efficiency standards.
		Design practices will require that the electrically powered HST technology be energy efficient, include regenerative braking to reduce energy consumption, and minimize grade changes in steep terrain to reduce energy consumption.
		Design practices will require that localized impacts be avoided through planning and design of the power distribution system for the HST system.
		Locate HST maintenance and storage facilities within proximity to major stations/termini.
	Energy use during construction of the HST system	Develop and implement a construction energy conservation plan.
		Use energy efficient construction equipment and vehicles.
		Locate construction material production facilities on site or in proximity to project construction sites.

Resource Area	Impact Area	Mitigation Measure
		Develop and implement a program encouraging construction workers to carpool or use public transportation for travel to and from construction sites.
Electromagnetic fields and electromagnetic interference	Exposure of electromagnetic fields to HST system workers, passengers, and nearby residents, schools and other facilities	Use standard design practices for overhead catenary power supply systems and vehicles, including appropriate materials, location and spacing of facilities, and power supply systems to minimize exposure to receptors over distance, and shielding with vegetation and other screening materials.
		Design overhead catenary system, substations, and transmission lines to reduce the electromagnetic fields to a practical minimum.
	Electromagnetic interference with electronic and electrical devices	Design the overhead catenary system, substations, and transmission lines to reduce the electromagnetic fields to a practical minimum.
		Design the project component to minimize arcing and radiation of radiofrequency energy.
		Choose devices generating radio frequency with a high degree of electromagnetic compatibility.
		Where appropriate, add electronic filters to attenuate radio frequency interference.
		Relocate receiving antennas and use antenna models with greater directional gain where appropriate, particularly for sensitive receptors near the HST system.
		Comply with the FCC regulations for intentional radiators, such as the proposed HST wireless systems.
		Establish safety criteria and procedures and personnel practices to avoid exposing employees with implantable medical devices to EMF levels that may cause interference with such implanted biomedical devices.
Land use	Incompatibility with land uses and disruption to communities	Continue to apply design practices to minimize property needed for the HST system and to stay within or adjacent to existing transportation corridors to the extent feasible.
		Work with local governments to consider local plans and local access needs, and to apply design practices to limit disruption to communities.
		Work with local governments to establish requirements for station area plans and opportunities for transit-oriented development.
		Work with local governments to enhance multi-modal connections for HST stations.
		Coordinate with cities and counties to ensure that HST facilities will be consistent with land use planning processes and zoning ordinances.
		Provide opportunities for community involvement early in project-level studies.
		Hold design workshops in affected neighborhoods to develop understanding of vehicle, bicycle, and pedestrian linkages in order to preserve those linkages through use of grade-separated crossings and other measures.
		Ensure that connectivity is maintained across the rail corridor (pedestrian/bicycle and vehicular crossings) where necessary to maintain neighborhood integrity.
		Develop facility, landscape, and public art design standards for HST corridors that reflect the character of adjacent affected neighborhoods.
		Maintain high level of visual quality of HST facilities in neighborhood areas by implementing such measures as visual buffers, trees and other landscaping, architectural design, and public artwork.
	Impacts to neighborhoods during construction	Develop a traffic management plan to reduce barrier effects during construction.
		To the extent feasible, maintain connectivity during construction.
Agricultural	Conversion of	Avoid farmland whenever feasible during the conceptual design stage of the project.

Resource Area	Impact Area	Mitigation Measure
lands	prime, statewide important, and unique farmlands, and farmlands of local importance, to project uses	Reduce the potential for impacts by sharing existing rail rights-of-way where feasible or by aligning HST features immediately adjacent to existing rail rights-of-way.
		Reduce the potential for impacts by reducing the HST right-of-way width to 50 feet in constrained areas.
		Increase protection of existing important farmlands by securing easements or participating in mitigation banks.
		Coordinate with and support the California Farmland Conservancy Program to secure conservation easements on farmland in geographic areas where the HST project creates impacts.
		Coordinate with private agricultural land trusts, local programs, mitigation banks, and Resource Conservation Districts to identify additional measures to limit important farmland conversion or provide further protection to existing important farmland.
	Severance of prime, statewide important, and unique farmlands, and farmlands of local importance, to project uses	Avoid farmland whenever feasible during the conceptual design stage of the project.
		Minimize severance of agricultural land by constructing underpasses and overpasses at reasonable intervals to provide property access.
		Work with landowners during final design of the system to enable adequate property access.
		Provide appropriate severance payments to landowners.
Aesthetics and visual resources		At the project-level, design proposed facilities that are attractive in their own right and that will integrate well into landscape contexts, so as to reduce potential view blockage, contrast with existing landscape settings, light and shadow effects, and other potential visual impacts.
		Design bridges and elevated guideways with graceful lines and minimal apparent bulk and shading effects.
		Design elevated guideways, stations, and parking structures with sensitivity to the context, using exterior materials, colors, textures, and design details that are compatible with patterns in the surrounding natural and built environment, and that minimize the contrast of the structures with their surroundings.
		Use neutral colors and dulled finishes that minimize reflectivity for catenary support structures, and design them to fit the context of the specific locale.
		Use aesthetically appropriate fencing along rights-of-way, including decorative fencing, where appropriate, and use dark and non-reflective colors for fencing to reduce visual contrast.
		Where at-grade or depressed route segments pass through or along the edge of residential areas or heavily traveled roadways, install landscape treatments along the edge of the right-of-way to provide partial screening and to visually integrate the right-of-way into the residential context.
		Use the minimum amount of night lighting consistent with that necessary for operations and safety.
		Use shielded and hooded outdoor lighting directed to the area where the lighting is required, and use sensors and timers for lights not required to be on all the time.
		Design stations to minimize potential shadow impacts on adjacent pedestrian areas, parks, and residential areas, and site all structures in a way that minimizes shadow effects on sensitive portions of the surrounding area.
		Seed and plant areas outside the operating rail trackbed that are disturbed by cut, fill, or grading to blend with surrounding vegetated areas, where the land will support plants. Use native vegetation in appropriate locations and densities.

Resource Area	Impact Area	Mitigation Measure
		Use strategic plantings of fast-growing trees to provide partial or full screening of elevated guideways where they are close to residential areas, parks, and public open spaces.
		Where elevated guideways are located down the median strips or along the edge of freeways or major roadways, use appropriate landscaping of the area under the guideway to provide a high level of visual interest. Landscaping in these areas should use attractive shrubs and groundcovers and should emphasize the use of low-growing species to minimize any additional shadow effects or blockage of views.
		Plan hours of construction operations and locate staging sites to minimize impacts to adjacent residents and businesses.
Public utilities		Make adjustments to the HST alignments and vertical profiles to avoid crossing or using major utility right-of-way or fixed facilities during engineering design.
		If avoidance is not feasible, in consultation and coordination with the utility owner, relocate or protect in-place transmission lines, substations, and any other affected facilities.
		For acquisition projects which result in utility relocation, follow the uniformity and equitable treatment policies, and comply with the requirements, of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 for all property necessary for the proposed HST system.
Hazardous materials and wastes		Investigate soils and groundwater for contamination and prepare environmental site assessments when necessary.
		Design realignment of the HST corridors to avoid identified sites.
		Relocate HST associated facilities such as stations to avoid identified sites.
		Remediate identified hazardous materials and hazardous waste contamination.
		Prior to demolition of buildings for project construction, survey for lead-based paint and asbestos-containing materials.
		Follow BMPs for testing, treating, and disposing of water, and acquire necessary permits from the regional water quality control board, if ground dewatering is required.
		When indicated by project-level environmental site assessments, perform Phase II environmental site assessments in conformance with the ASTM Standards related to the Phase II Environmental Site Assessment Process to identify specific mitigation measures.
		Prepare a Site Management Program/Contingency Plan prior to construction to address known and potential hazardous material issues, including: a. measures to address management of contaminated soil and groundwater; b. a site-specific Health and Safety Plan (HASP), including measures to protect construction workers and general public; and c. procedures to protect workers and the general public in the event that unknown contamination or buried hazards are encountered.
		As part of the second-tier environmental review, consider impacts to the environment on sites identified on the Cortese list (Government Code Section 65962.4) at that time.
Cultural and paleon-tological resources	Impacts to archaeological resources and traditional cultural properties	Avoid the impact, or when avoidance cannot be accommodated, minimize the scale of the impact.
		Incorporate the site into parks or open space.
		Provide data recovery for archaeological resources, which may include excavation of an adequate sample of the site contents so that research questions applicable to the site can be addressed.

Resource Area	Impact Area	Mitigation Measure
		Develop procedures for fieldwork, identification, evaluation, and determination of potential effects to archaeological resources in consultation with SHPO and Native American tribes. Procedures may include onsite monitoring when sites are known or suspected of containing Native American human remains and be reflected in Memoranda of Agreement with appropriate bodies.
		Coordinate and consult with tribal representatives.
	Impacts to historic properties/ resources	Avoid the impact through project design. Prepare and utilize a treatment plan for protection of historic properties/resources that will describe methods to preserve, stabilize, shore/underpin, and monitor buildings, structures, and objects.
		Avoid high vibration construction techniques in sensitive areas.
		Record and document cultural resources that would be adversely affected by the project to the standards of the Historic American Building Survey or Historic American Engineering Record.
		Develop design guidelines to ensure sympathetic, compatible, and appropriate designs for new construction.
		Consult with architectural historians or historical architects to advise on appropriate architectural treatment of the structural design of proposed new structures. Prepare interpretive and/or educational materials and programs regarding the affected historic properties/resources. Materials may include: a popular report, documentary videos, booklets, and interpretive signage.
		Make interpretive information available to state and local agencies, such as salvage items, historic drawings, interpretive drawings, current and historic photographs, models, and oral histories. Also assist with archiving and digitizing the documentation of the cultural resources affected and disseminating material to the appropriate repositories.
		Relocate and rehabilitate historic properties/resources that would otherwise be demolished because of the project.
		Monitor project construction to ensure it conforms to design guidelines and any other treatment procedures agreed to by the parties consulting pursuant to Section 106 of the National Historic Preservation Act. Repair inadvertent damage to historic properties/resources in accordance with the Secretary of the Interior's Standards for Treatment of Historic Properties.
		Salvage selected decorative or architectural elements of the adversely affected historic properties/resources, and retain and incorporate salvaged items into new construction where possible. If reuse is not possible, make salvaged items available for use in interpretive displays near the affected resources or in an appropriate museum.
		Implement an agreement with appropriate bodies specifying procedures for addressing historic resources which may be affected by the HST system.
	Impacts to paleontological resources	Educate workers.
		Recover fossils identified during the field reconnaissance.
		Monitor construction.
		Develop protocols for handling fossils discovered during construction, such as temporary diversion of construction equipment so that the fossils could be recovered, identified, and prepared for dating, interpreting, and preserving at an established, permanent, accredited research facility.
Geology and soils	Seismic hazards	Design structures to withstand anticipated ground motion, using design options such as redundancy and ductility.
		Prevent liquefaction and resulting structural damage and traffic hazards using: 1. ground modification techniques such as soil densification; and 2. structural design, such as deep foundations.

Resource Area	Impact Area	Mitigation Measure
		Utilize motion sensing instruments to provide ground motion data and a control system to temporarily shut down HST operations during or after an earthquake to reduce risks.
		Design and engineer all structures for earthquake activity using Caltrans Seismic Design Criteria.
		Design and install foundations resistant to soil liquefaction and settlement.
		Identify potential serpentinite bedrock disturbance areas and implement a safety plan.
		Apply Section 19 requirements from the most current Caltrans Standard Specifications to ensure geotechnically stable slopes are planned and created.
		Install passive or active gas venting systems and gas collection systems in areas where subsurface gases are identified.
		Remove corrosive soil and use corrosion protected materials in infrastructure.
		Address erosive soils through soil removal and replacement, geosynthetics, vegetation, and/or riprap, where warranted.
		Remove or moisture condition shrink/swell soils.
		Utilize stone columns, grouting, and deep dynamic compaction in areas of potential liquefaction.
		Utilize buttress berms, flattened slopes, drains, and/or tie-backs in areas of slope instability.
		Avoid settlement through preloading, use of stone columns, deep dynamic compaction, grouting, and/or special foundation designs.
	Surface rupture hazards	Install early warning systems triggered by strong ground motion associated with ground rupture, such as linear monitoring systems (i.e., time domain reflectometers) along major highways and rail lines within the zone of potential rupture to provide early warnings and allow for temporary control of rail and automobile traffic to avoid and reduce risks.
		Continue to modify alignments to avoid crossing known or mapped active faults within tunnels.
		Avoid active faults to the extent possible. Where avoidance is not possible, cross active faults at grade and perpendicular to the fault line.
	Slope instability	Install temporary and permanent slope reinforcement and protection, based on geotechnical investigations, and review of proposed earthwork and foundation excavation plans.
		Conduct geotechnical inspections during construction to verify that no new unanticipated conditions are encountered.
		Incorporate slope monitoring in final design.
	Difficulty in excavation	Identify areas of potentially difficult excavation to ensure safe practices.
		Focus future geotechnical engineering and geologic investigations in areas of potentially difficult excavation.
		Monitor conditions during and after construction.
		Employ tunnel excavation and lining techniques to ensure safety.
	Hazards related to oil and gas fields	Follow federal and state Occupational Safety and Health Administration regulatory requirements for excavations.
		Consult with other agencies such as the Department of Conservation's Division of Oil and Gas, or the Department of Toxic Substances Control regarding known areas of concern.
		Use safe and explosion-proof equipment during construction.

Resource Area	Impact Area	Mitigation Measure
		Test for gases regularly.
		Install monitoring systems and alarms in underground construction areas and facilities where subsurface gases are present.
		Install gas barrier systems.
Hydrology and water resources	Impacts on floodplains	Avoid or minimize construction of facilities within floodplains where feasible.
		Minimize the footprint of facilities within the floodplain through design changes or the use of aerial structures and tunnels.
		Restore the floodplain to its prior operation in instances where the floodplain is affected by construction.
	Impacts on surface waters	Use construction methods and facility designs to minimize the potential encroachments onto surface water resources.
		Minimize sediment transport caused by construction by following BMPs as part of NPDES and SWPPP requirements that will be included in construction permits. BMPs may include measures such as: a. providing permeable surfaces where feasible; b. retaining and treating stormwater on site using catch basins and filtering wet basins; c. minimizing the contact of construction materials, equipment, and maintenance supplies with stormwater; d. reducing erosion through soil stabilization, watering for dust control, installing perimeter silt fences, placing rice straw bales, and installing sediment basins; e. maintaining water quality by using infiltration systems, detention systems, retention systems, constructed wetland systems, filtration systems, biofiltration/bioretention systems, grass buffer strips, ponding areas, organic mulch layers, planting soil beds, sand beds, and vegetated systems such as swales and grass filter strips that are designed to convey and treat either fallow flow (swales) or sheetflow (filter strips) runoff.
		Use methods such as habitat restoration, reconstruction of habitat on site, and habitat replacement off site to minimize surface water quality impacts.
		Comply with mitigation measures included in permits issued under Sections 404 and 401 of the federal Clean Water Act.
		Comply with requirements in the SWPPP to reduce pollutants in storm water discharges and the potential for erosion and sedimentation.
		Comply with requirements of Section 10 of the federal Rivers and Harbors Act for work required around a water body designated as navigable and applicable permit requirements.
		Comply with the requirements of a state Streambed Alteration Agreement for work along the banks of various surface water bodies.
		Implement a spill prevention and emergency response plan to handle potential fuel or other spills.
		Where feasible, avoid significant development of facilities in areas that may have substantial erosion risk, including areas with erosive soils or steep slopes.
	Impacts on groundwater	Minimize development of facilities in areas that may have substantial groundwater discharge or affect recharge.
		Apply for, obtain, and comply with conditions of applicable waste discharge requirements as part of project-level review.
		Develop facility designs that are elevated, or at a minimum are permeable, and will not affect recharge potential where construction is required in areas of potentially substantial groundwater discharge or recharge.

Resource Area	Impact Area	Mitigation Measure
		Apply for and obtain a SWPPP for grading, with BMPs that will control release of contaminants near areas of surface water or groundwater recharge. BMPs may include constraining fueling and other sensitive activities to alternative locations, providing drip plans under some equipment, and providing daily checks of vehicle condition.
		Use and retain native materials with high infiltration potential at the ground surface in areas that are critical to infiltration for groundwater recharge.
Biological resources and wetlands	Impacts to sensitive vegetation communities (as defined at the project level)	Utilize existing transportation corridors and rail lines to minimize potential impacts.
		Use large diameter tunnels as part of the design to limit surface access needs in tunnels for ventilation or evacuation, as a method to avoid or limit impacts to vegetation and habitat above tunnels.
		Use in-line construction (i.e., use new rail infrastructure as it is built) to transport equipment to/from the construction site and to transport excavated material away from the construction to appropriate re-use or disposal sites to minimize impacts from construction access roads on vegetation/habitat.
		Accomplish necessary geologic exploration in sensitive areas by using helicopters to transport drilling equipment and for site restoration to minimize surface disruption.
		Use and reuse excavated materials within the confines of the project.
		Participate in or contribute to existing or proposed conservation banks or natural management areas, including possible acquisition, preservation, or restoration of habitats.
		Revegetate/restore impacted areas, with a preference for onsite mitigation over offsite, and with a preference for offsite mitigation within the same watershed or in close proximity to the impact where feasible.
		Comply with the Biological Resources Management Plan(s) developed or identified during project-level studies, as reviewed by the USFWS, CDFG, and USACE.
		Conduct preconstruction focused biological surveys.
		Conduct biological construction monitoring.
		Undertake plant relocation, seed collection, plant propagation, and outplanting at suitable mitigation sites.
		Prevent the spread of weeds during construction and operation by identifying areas with existing weed problems and measures to control traffic moving out of those areas such as cleaning construction vehicles or limiting the movement of fill.
	Impacts to wildlife movement corridors	Construct wildlife underpasses, bridges, and/or large culverts to facilitate known wildlife movement corridors.
		Ensure that wildlife crossings are of a design, shape, and size to be sufficiently attractive to encourage wildlife use.
		Provide appropriate vegetation to wildlife overcrossings and undercrossings to afford cover and other species requirements.
		Establish functional corridors to provide connectivity to protected land zoned for uses that provide wildlife permeability.

Resource Area	Impact Area	Mitigation Measure
		Design protective measures for wildlife movement corridors using the following process in consultation with resource agencies: a. identify the habitat areas the corridor is designed to connect; b. select several species of interest from the species present in the area; c. evaluate the relevant needs of each selected species; d. for each potential corridor, evaluate how the area will accommodate movement by each species of interest; e. draw the corridors on a map; and f. design a monitoring program.
		Utilize existing transportation corridors and rail lines to minimize potential impacts.
		Use aerial structures or tunnels to allow for unhindered crossing by wildlife.
	Impacts to nonwetland jurisdictional waters	Utilize existing transportation corridors and rail lines to minimize potential impacts.
		Return degraded habitat to pre-existing conditions.
		Create new habitat by converting nonwetland habitats into wetland or other aquatic habitat.
		Enhance existing habitats by increasing one or more functions through activities such as plantings or nonnative vegetation eradication.
		Provide for passive revegetation by allowing a disturbed area to revegetate naturally.
		Purchase credits in an existing wetlands or aquatic habitat mitigation bank.
		Provide in-lieu fee payments to an agency or other entity who will provide aquatic habitat conservation or restoration.
		Prefer onsite mitigation over offsite mitigation, and for offsite mitigation, prefer that it be located within the same watershed or as close in proximity to the area of impact as possible.
	Impacts to wetlands	Utilize existing transportation corridors and rail lines to minimize potential impacts.
		Return degraded habitat to pre-existing conditions.
		Create new habitat by converting nonwetland habitats into wetland or other aquatic habitat.
		Enhance existing habitats by increasing one or more functions through activities such as plantings or nonnative vegetation eradication.
		Provide for passive revegetation by allowing a disturbed area to revegetate naturally.
		Purchase credits in an existing wetlands or aquatic habitat mitigation bank.
		Provide in-lieu fee payments to an agency or other entity who will provide aquatic habitat conservation or restoration.
		Develop and implement measures to address the “no net loss” policy for wetlands.
		Prefer onsite mitigation over offsite mitigation, and for offsite mitigation, prefer that it be located within the same watershed or as close in proximity to the area of impact as possible.
	Impacts to marine and anadromous fishery resources	Utilize existing transportation corridors and rail lines to minimize potential impacts.
		Comply with the terms of a Streambed Alteration Agreement for work along banks of surface water bodies.
		Implement a spill prevention and emergency response plan to handle potential fuel or other spills.
		Incorporate biofiltration swales to intercept runoff.

Resource Area	Impact Area	Mitigation Measure
		Where feasible, avoid significant development of facilities in areas that may have substantial erosion risk, including areas with erosive soils and steep slopes.
	Impacts to special status species	Utilize existing transportation corridors and rail lines to minimize potential impacts.
		Relocate sensitive species.
		Conduct preconstruction focused surveys.
		Conduct biological construction monitoring.
		Restore suitable breeding and foraging habitat.
		Purchase credits from an existing mitigation bank.
		Participate in an existing Habitat Conservation Plan.
		Phase construction around the breeding season.
Public parks and recreation resources	Impacts to parks and recreational resources	Continue to apply design practices to avoid impacts to park resources, and when avoidance cannot be accommodated, minimize the scale of the impact.
		Apply measures at the project level to reduce and minimize indirect/proximity impacts as appropriate for the particular sites affected, while avoiding other adverse impacts (e.g., visual), such as noise barriers, visual buffers, and landscaping.
		Apply measures to modify access to/egress from the recreational resource to reduce impacts to these resources.
		Design and construct cuts, fill, and aerial structures to avoid and minimize visual impacts to units of the state park system.
		Incorporate wildlife under- or overcrossings at appropriate intervals as necessary.
		Where public parklands acquired with public funds will be acquired for nonpark use as part of the HST system, commit as required by law to providing funds for the acquisition of substantially equivalent substitute parkland or to acquiring/providing substitute parkland of comparable characteristics for construction impacts.
		Restore affected parklands to natural state and replace or restore affected park facilities.
		If park facilities must be relocated, provide planning studies as well as appropriate design and replacement with minimal impact on park use.
		Use local native plants for revegetation.
		Develop and implement construction practices, including scheduling, to limit impacts to wildlife, wildlife corridors, and visitor use areas within public parks.
		For temporary unavoidable loss of park and recreation facility uses, consider providing compensation.
Cumulative	Impacts on traffic and circulation and travel conditions	The following program-level mitigation strategies can be developed, in consultation with state, federal, regional, and local governments and affected transit agencies, to improve the flow of intercity travel on the primary routes and access to the proposed stations or airports and would reduce this impact: 1. Regional strategies will include coordination with Regional Transportation planning and Intelligent Transportation System Strategies. 2. Local improvements could employ TSM/Signal Optimization; local spot widening of curves; and major intersection improvements.
		The following program-level mitigation strategies can be developed, in consultation with state, federal, regional, and local governments and affected transit agencies, to improve the flow of intercity travel on the primary routes and access to the proposed stations or airports and would reduce this impact: 1. Regional strategies would include coordination with Regional Transportation planning and Intelligent Transportation System Strategies. 2. Local improvements could employ TSM/Signal Optimization; local spot widening of curves; and major intersection improvements.

Resource Area	Impact Area	Mitigation Measure
	Impacts on air quality	The project-level mitigation strategies to address localized impacts can include the following and would reduce this impact: 1. Increase emission controls from power plants supplying power for the HST alignment. 2. Design the system to utilize energy efficient, state-of-the-art equipment. 3. Promote increased use of public transit, alternative fueled vehicles, and parking for carpools, bicycles, and other alternative transportation methods. 4. Alleviate traffic congestion around passenger station areas. 5. Minimize construction air emissions.
	Impacts on noise and vibration	The program-level mitigation strategies include the following and would reduce this impact: 1. Design practices emphasizing the use of tunnels or trenches. 2. Use of electric powered trains, higher quality track interface, and smaller, lighter, and more aerodynamic trainsets. 3. Full grade separations from all roadways.
		The project-level mitigation strategies include the following and would reduce this impact: 1. Treatments for insulation of buildings affected by noise and vibration. 2. Sound barrier walls within the right-of-way. 3. Track treatments to minimize train vibrations. 4. Construction mitigation.
	Impacts on land use and planning, communities and neighborhoods, property, and environmental justice	The program-level mitigation strategies for HST alignment contributions to the land use impacts include the following and would reduce this impact: 1. Design practices to maximize use of existing rights-of-way and incorporating strategies for stations to incorporate transit-oriented design. 2. Coordination with cities and counties in each region to ensure that project facilities will be consistent with land use planning processes and zoning ordinances.
	Impacts on agricultural lands	The program-level mitigation strategies include the following and would reduce this impact: 1. Design practices to avoid agricultural land conversion through maximizing use of existing rights-of-way to minimize encroachment on additional agricultural lands. 2. Utilizing aerial structure or tunnel alignments to allow for vehicular and pedestrian traffic access across the alignment. 3. Reducing the new right-of-way to 50 feet in constrained areas.
		The project-level mitigation strategies include the following and would reduce this impact: 1. Securing easements. 2. Participating in mitigation banks. 3. Increasing permanent protection of farmlands at the local planning level. 4. Coordinating with various local, regional, and state agencies support farmland conservation programs.
	Impacts on aesthetics and visual resources	The program-level mitigation strategies include the following and would reduce this impact: 1. Design practices that will incorporate local agency and community input during subsequent project-level environmental review in order to develop context sensitive aesthetic designs and treatments for infrastructure.

Resource Area	Impact Area	Mitigation Measure
		The project-level mitigation strategies include the following and would reduce this impact: 1. Design of facilities that integrate into landscape contexts, which will reduce potential view blockage, contrast with existing landscape settings, and light and shadow effects.
	Impacts on public utilities	The program-level mitigation strategies include the following and would reduce this impact: 1. Design practices that will avoid potential conflicts, at the project-level analysis, to the extent feasible and practical. These practices include design methods to avoid crossing or using utility rights-of-way by modifying both the horizontal and vertical profiles of proposed transportation improvements. Emphasis will be placed on detailed alignment design to avoid potential contribution to cumulative impacts from linear facilities on land use opportunities and to minimize conflicts with existing major fixed public utilities and supporting infrastructure facilities.
		The project-level mitigation strategies include the following and would reduce this impact: 1. Coordination with utility representatives during construction in the vicinity of critical infrastructure will occur.
	Impacts on cultural and paleontological resources	The program-level mitigation strategies include the following and would reduce this impact: 1. Continued consultation with SHPO will occur to define and describe general procedures to be applied in the future for fieldwork, method of analysis, and the development of specific mitigation measures to address effects and impacts to cultural resources, resulting in a programmatic agreement between the Authority, FRA, and SHPO. 2. Consultation with Native American tribes will occur.
		The project-level mitigation strategies include the following and would reduce this impact: 1. Avoidance measures through identification of sensitive resources within the project-level analysis, project design refinement, and careful selection of alignments. 2. Subsequent project-level field studies to verify the location of cultural resources will offer opportunities to avoid or minimize direct impacts on resources, based on the type of project, type of property, and impacts to the resource.
	Impacts on geology and soils	The program-level mitigation strategies include the following and would reduce this impact: 1. Design practices will be used while preparing extensive alignment studies to ensure that potential effects related to major geologic hazards such as major fault crossings, oil fields, and landslide areas will be avoided. 2. Mitigation for potential impacts will be developed on a site-specific basis, based on detailed geotechnical studies to address ground shaking, fault crossings, slope stability/landslides, areas of difficult excavation, hazards related to oil and gas fields, and mineral resources.
	Impacts on hydrology and water resources	The program-level mitigation strategies include the following and would reduce this impact: 1. Design practices to maximize use of existing rights-of-way to minimize potential impacts on water resources.

Resource Area	Impact Area	Mitigation Measure
		The project-level mitigation strategies include the following and would reduce this impact: 1. Avoidance and minimization measures will be incorporated into the development, design, and implementation phases. 2. Close coordination will occur with the regulatory agencies to develop specific design and construction standards for stream crossings, infrastructure setbacks, erosion control measures, sediment controlling excavation/fill practices, and other best management practices. 3. Mitigation strategies specific to reconstruction, restoration, or replacement of the resource will occur, in close coordination with state and federal resource agencies, related to flood plains; surface waters, runoff, and erosion; and groundwater.
	Impacts on biological resources and wetlands	The program-level mitigation strategies include the following and would reduce this impact: 1. Design practices to maximize use of existing rights-of-way to minimize potential impacts on biological resources and wetlands.
		The project-level mitigation strategies include the following and would reduce this impact: 1. Avoidance and minimization measures will be incorporated into the development, design, and implementation phases. 2. Close coordination will occur with the regulatory agencies to develop specific design and construction standards for stream crossings, infrastructure setbacks, monitoring during construction, and other best management practices. 3. Mitigation strategies specific to reconstruction, restoration, or replacement of the resource will occur, in close coordination with state and federal resource agencies, related to wetlands. 4. Field studies will be conducted to verify the location, in relation to the HST alignments, of sensitive habitat, wildlife movement corridors, and wetlands. These studies will provide further opportunities to minimize and avoid potential impacts on biological resources through changes to the alignment plan and profile in sensitive areas. For example, the inclusion of design features such as elevated track structures over drainages and wetland areas and wildlife movement corridors will minimize potential impacts to wildlife and sensitive species.
	Impacts on Section 4(f) and 6(f) resources (public parks and recreational resources)	The program-level mitigation strategies include the following and would reduce this impact: 1. Incorporation of sound barriers (e.g., walls, berms, or trenches), visual buffers/landscaping, and modification of transportation access to/egress from the public lands and recreational resource. 2. Incorporation of design modifications or controls on construction schedules, phasing, and activities.

<table>
<tr><th>Resource Area</th><th>Impact Area</th><th>Mitigation Measure</th></tr>
<tr><td></td><td></td><td>The project-level mitigation strategies include the following and would reduce this impact:
1. Beautification measures.
2. Replacement of land or structures or their equivalents on or near their existing site(s).
3. Tunneling, cut and cover, and cut and fill of right-of-ways.
4. Treatment of embankments.
5. Planting, screening, creating wildlife corridors, acquisition of land for preservation, and installation of noise barriers.
6. Establishment of pedestrian or bicycle paths.
7. Other potential mitigation strategies identified during the public input process.</td></tr>
<tr><td></td><td></td><td>In the event that HST alignments or facilities are located within or in close proximity to public parks, the following mitigations for natural, cultural, aesthetic, and recreational impacts may be considered to offset the contribution to the cumulative impact, including but not limited to:
1. Compensation for temporary and loss of park and recreation use.
2. Recordation of any historic features removed.
3. If necessary, provide alternative shuttle access service to park visitors.
4. Restore directly impacted park lands to a natural state.
5. If any facilities must be relocated, provide planning studies as well as design and appropriate replacement with minimal impact on park use.
6. Inventory and record affected historic structures. Provide appropriate mitigation for adverse effects to historic structures.
7. Require appropriate vehicle cleaning for all construction equipment used near units of the California State Park System to protect against spreading exotic plants or disease.
8. Use local native plants for revegetation.
9. Design and construct cuts, fills, and aerial structures to avoid and minimize visual impact to units of the State Park System.
10. In addressing impacts to wildlife movement corridors and habitat directly related to California State Park System units, consult with the California Department of Parks and Recreation.
11. Incorporate wildlife under- or overcrossings as necessary.
12. Adopt construction practices to protect critical wildlife corridors and visitor use areas within public parks.</td></tr>
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